THE BRITISH JOURNAL PHOTOGRAPHIC ALMANAC

AND

Photographer's Daily Companion

FOR

1898.

EDITED BY THOMAS BEDDING, F.R.P.S.

ADVERTISERS' INDEX, see pp. 1133 to 1136.
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PREFACE.

Last year's volume of The British Journal Photographic Almanac brought me so many expressions of appreciation from its readers in all parts of the world that no other inducement was needed to guide me in compiling the present issue on as nearly as possible identical lines. The rearrangement of the contents then adopted has consequently been adhered to on this occasion. Some small additions to the Formulæ section have been made, and I have endeavoured in the remaining divisions of the book to epitomise as fully as possible all the important advances and improvements in practical photography that have taken place during the past year.

Lack of space has obliged me to omit many interesting articles, while other considerations have also necessitated the neglect of numerous suggestions that have reached me from time to time, having for object the enhancement of the Almanac's usefulness.

To Messrs. Wellington & Ward, for the frontispiece; to Messrs. Waterlow; to the London Stereoscopic Company; and to Messrs. Smedley & Co., my thanks are due, and are hereby tendered, for the illustrations interspersed in the text matter.

The miscellaneous articles, by over a hundred contributors, supply a wealth of useful and informative reading; and I beg the authors to accept my warmest acknowledgments of their support. The writing of this brief preface to the Almanac is a task that is as pleasant as it is simple, for it is the one opportunity in the year that falls to me of adopting the first person singular towards a world-wide circle of readers of The British Journal of Photography and the Almanac, and of enabling me to say that I wish them and photography every prosperity in the New Year.

Thomas Bedding,

Editor.

London, November, 1897.

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AND

ZEISS' AND GOERZ' ANASTIGMATS, &c.

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1898

NOTICE OF REMOVAL.

THE OFFICES of the 'BRITISH JOURNAL OF PHOTOGRAPHY,' and 'British Journal Photographic Almanac,' will be

REMOVED ON JANUARY 1st, 1898,

to Larger and more Convenient Premises at

24 Wellington Street, Strand, London.

JANUARY.

S	M	T	W	T	F	S
..	..	..	..	..	..	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
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30	31	..	..	..	..	..

FEBRUARY.

S	M	T	W	T	F	S
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MARCH.

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APRIL.

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MAY.

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JUNE.

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JULY.

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24	25	26	27	28	29	30
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AUGUST.

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SEPTEMBER.

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OCTOBER.

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9	10	11	12	13	14	15
16	17	18	19	20	21	22
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30	31	..	..	..	..	..

NOVEMBER.

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20	21	22	23	24	25	26
27	28	29	30	..	..	..
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DECEMBER.

S	M	T	W	T	F	S
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POSTAL AND TELEGRAPHIC ADDRESSES, 1139 to 1146.

For Several Important New Series of

ROSS' ZEISS' & GOERZ' LENSES

See pages 35 to 98.

ROSS Ltd., 111 New Bond Street, London, W.

CORNER OF BROOK STREET.

JANUARY.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. Morn.	Moon. Sets. Morn.
1	S		8 9	4 0	11 36	1 57
2	S	2nd Sunday after Christmas	8 8	4 1	11 55	3 8
3	M	Prof. J. W. Draper d. 1882	8 8	4 2	After	4 17
4	Tu		8 8	4 3	0 55	5 24
5	W		8 8	4 4	1 38	6 23
6	Th	Epiphany [(Paris), 1839	8 8	4 5	2 33	7 13
7	F	Daguerreotype com. to Acad. of Sc.	8 7	4 6	3 36	7 53
8	S	○ 0.24 M	8 7	4 8	4 46	8 23
9	S	1st Sunday after Epiphany	8 6	4 9	5 59	8 47
10	M		8 6	4 11	7 13	9 7
11	Tu		8 5	4 12	8 27	9 21
12	W		8 4	4 13	9 42	9 36
13	Th	William Bedford d. 1893	8 3	4 15	10 58	9 50
14	F		8 3	4 17	Morn	10 5
15	S	G. W. Simpson d. 1880. ☾ 3.45 A.	8 2	4 18	0 17	10 22
16	S	2nd Sunday after Epiphany	8 1	4 20	1 39	10 43
17	M		8 0	4 21	3 4	11 11
18	Tu	E. Lacan d. 1879. Rejlander d. 1875	7 59	4 23	4 28	11 52
19	W		7 58	4 24	5 43	After
20	Th	Photo. Soc. of Lond. f. 1853	7 57	4 26	6 43	2 3
21	F	Fox Talbot b. 1800	7 56	4 28	7 27	3 30
22	S	Sir W. Newton d. 1869. ● 7.25 M.	7 55	4 30	7 59	4 59
23	S	3rd Sunday after Epiphany	7 54	4 31	8 22	6 26
24	M		7 53	4 33	8 39	7 49
25	Tu		7 51	4 35	8 55	9 9
26	W		7 50	4 37	9 9	10 25
27	Th	[1863	7 48	4 38	9 24	11 39
28	F	Photo-sculpture pat. by Willème,	7 47	4 40	9 40	Morn
29	S	☽ 2.33 A.	7 46	4 42	9 59	0 52
30	S	4th Sunday after Epiphany. Fox	7 45	4 44	10 23	2 4
31	M	[Talbot's first c. to Roy. Soc. 1839	7 43	4 45	10 53	3 11

[*See page* 558.

JANUARY.

D. M.	D. W.	MEMORANDA.
1	S	
2	S	*For* Meetings of Societies, *see pp.* 574–623.
3	M	
4	Tu	
5	W	
6	Th	
7	F	
8	S	
9	S	
10	M	
11	Tu	
12	W	
13	Th	
14	F	
15	S	
16	S	
17	M	
18	Tu	
19	W	
20	Th	
21	F	
22	S	
23	S	
24	M	
25	Tu	
26	W	
27	Th	
28	F	
29	S	
30	S	
31	M	

FEBRUARY.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. Morn.	Moon. Sets. Morn.
1	Tu		7 41	4 47	11 33	4 15
2	W		7 40	4 49	After	5 8
3	Th		7 38	4 51	1 23	5 51
4	F		7 37	4 53	2 32	6 26
5	S		7 35	4 54	3 44	6 52
6	S	Septuagesima Sunday. ○ 6 24 A.	7 33	4 56	4 59	7 13
7	M		7 31	4 58	6 14	7 29
8	Tu	Calotype Process pat. 1841	7 30	5 0	7 29	7 44
9	W		7 28	5 2	8 46	7 59
10	Th	Sir David Brewster d. 1868	7 26	5 4	10 5	8 14
11	F		7 24	5 5	11 26	8 30
12	S	[d. 1868	7 22	5 7	Morn	8 49
13	S	Sexagesima Sun. Leon Foucault	7 20	5 9	0 50	9 15
14	M	St. Valentine. ☾ 0.35 M.	7 19	5 11	2 13	9 49
15	Tu	Oliver Sarony b. 1820	7 17	5 13	3 30	10 38
16	W	Glasgow Photo. Society found. 1860	7 15	5 15	4 33	11 43
17	Th		7 13	5 16	5 22	After
18	F	Moule's Photogen (artificial light for	7 11	5 18	5 57	2 28
19	S	[portraiture) pat. 1857	7 9	5 20	6 23	3 55
20	S	Quinquagesima (Shrove) Sunday.	7 7	5 22	6 42	5 21
21	M	[Poitevin's p. of Helioplastie pub.	7 5	5 24	6 59	6 42
22	Tu	[1855. ● 7.41 A.	7 3	5 26	7 14	8 0
23	W		7 1	5 27	7 29	9 16
24	Th		6 59	5 29	7 44	10 31
25	F	[1876. Arago b. 1786	6 56	5 31	8 3	11 45
26	S	Senefelder d. 1834. Padre Secchi d.	6 54	5 33	8 25	Morn
27	S	1st Sunday in Lent	6 52	5 34	8 52	0 56
28	M	☽ 11.13 M.	6 50	5 36	9 29	2 1

FEBRUARY.

D. M.	D. W.	MEMORANDA.
1	Tu	*For* MEETINGS OF SOCIETIES, *see pp.* 574–623.
2	W	
3	Th	
4	F	
5	S	
6	S	
7	M	
8	Tu	
9	W	
10	Th	
11	F	
12	S	
13	S	
14	M	
15	Tu	
16	W	
17	Th	
18	F	
19	S	
20	S	
21	M	
22	Tu	
23	W	
24	Th	
25	F	
26	S	
27	S	
28	M	

MARCH.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. Morn.	Moon. Sets. Morn.
1	Tu		6 48	5 38	10 15	2 58
2	W		6 46	5 40	11 11	3 47
3	Th		6 44	5 41	After	4 24
4	F	Poitevin d. 1882	6 42	5 43	1 26	4 53
5	S	La Place d. 1827. J. Albert b. 1825	6 39	5 45	2 39	5 16
6	S	2nd S. in Lent. Fraunhofer b. 1787	6 37	5 47	3 55	5 35
7	M	J. N. Niepce b. 1765. Herschel b. 1792	6 35	5 48	5 11	5 51
8	Tu	○ 9.29 M.	6 33	5 50	6 28	6 6
9	W	G. W. Wilson d. 1893	6 30	5 52	7 48	6 21
10	Th		6 28	5 54	9 11	6 37
11	F	St. Claire Deville b. 1818	6 26	5 55	10 35	6 55
12	S		6 24	5 57	11 59	7 20
13	S	3rd Sunday in Lent	6 21	6 59	Morn	7 52
14	M	Herschel int. hypo for fixing, 1839	6 19	6 1	1 18	8 37
15	Tu	F. A. Wenderoth d. 1884. ☾ 7.48 M.	6 17	6 2	2 26	9 37
16	W		6 15	6 4	3 18	10 50
17	Th		6 12	6 5	3 57	After
18	F		6 10	6 7	4 25	1 36
19	S	Thos. Sutton d. 1875	6 8	6 9	4 47	2 58
20	S	4th Sunday in Lent	6 6	6 11	5 4	4 19
21	M		6 3	6 12	5 20	5 38
22	Tu	● 8.37 M	6 1	6 14	5 35	6 54
23	W		5 59	6 16	5 51	8 9
24	Th	Becquerel b. 1820	5 57	6 18	6 8	9 24
25	F	Hermagis d. 1868	5 54	6 19	6 29	10 36
26	S		5 52	6 21	6 55	11 45
27	S	5th Sun. in Lent. Edgar Pickard	5 49	6 22	7 28	Morn
28	M	La Place b. 1749 [d. 1897	5 47	6 24	8 9	0 46
29	Tu		5 45	6 26	9 1	1 39
30	W	☽ 7.40 M.	5 43	6 28	10 2	2 20
31	Th		5 40	6 30	11 8	2 52

MARCH.

D. M.	D. W.	MEMORANDA.
1	Tu	*For* MEETINGS OF SOCIETIES, *see pp.* 574-623.
2	W	
3	Th	
4	F	
5	S	
6	S	
7	M	
8	Tu	
9	W	
10	Th	
11	F	
12	S	
13	S	
14	M	
15	Tu	
16	W	
17	Th	
18	F	
19	S	
20	S	
21	M	
22	Tu	
23	W	
24	Th	
25	F	
26	S	
27	S	
28	M	
29	Tu	
30	W	
31	Th	

APRIL.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. After.	Moon. Sets. Morn.
1	F	[cault, 1845. Morse d. 1872	5 38	6 31	0 19	3 18
2	S	First Sun Photo. by Fizeau and Fou-	5 36	6 33	1 33	3 39
3	S	Palm Sunday	5 34	6 34	2 49	3 55
4	M	[b. 1795	5 31	6 36	4 6	4 10
5	Tu	Rev. J. B. Reade b. 1801. Isid. Niepce	5 29	6 37	5 25	4 25
6	W	○ 9.20 A. [Victor d. 1870	5 27	6 39	6 47	4 41
7	Th	Voigtländer d. 1878. Niepce de St.	5 25	6 41	8 12	5 0
8	F	Good Friday [1839	5 23	6 43	9 38	5 23
9	S	Fox Talbot's First Art. in *Athenæum*,	5 20	6 44	11 3	5 53
10	S	Easter Sun. Pouncy's Carb. Pro.	5 18	6 46	Morn	6 34
11	M	[pat. 1858. Clarence Fry d. 1897	5 16	6 47	0 16	7 30
12	Tu	T. R. Williams d. 1871	5 14	6 49	1 15	8 40
13	W	☾ 2.28 A.	5 11	6 51	1 58	10 0
14	Th		5 9	6 53	2 28	11 24
15	F		5 7	6 54	2 52	After
16	S		5 5	6 56	3 10	2 6
17	S	Low Sunday. Fargier's Carbon	5 3	6 57	3 26	3 22
18	M	[Process pat. 1861	5 1	6 59	3 42	4 38
19	Tu	Warren de la Rue d. 1889	4 58	7 0	3 56	5 53
20	W	J. A. Spencer d. 1878. ● 10.21 A.	4 56	7 2	4 13	7 7
21	Th	Talbot's Photo.-etch. Proc. pat. 1858	4 54	7 4	4 32	8 20
22	F		4 52	7 6	4 56	9 30
23	S		4 50	7 7	5 26	10 35
24	S	2nd Sunday after Easter. Celsius	4 48	7 9	6 5	11 31
25	M	'Sun-blinds' pat. 1862 [d. 1744	4 46	7 10	6 53	Morn
26	Tu	Adam Salomon d. 1881	4 44	7 12	7 50	0 15
27	W	Morse b. 1791	4 42	7 14	8 56	0 50
28	Th	M. Carey Lea d. 1897	4 40	7 16	10 5	1 18
29	F	☽ 2.5 M.	4 38	7 17	11 16	1 40
30	S	Col. Stuart Wortley d. 1890	4 36	7 19	After	1 58

APRIL.

For Meetings of Societies, *see pp.* 574–623.

D. M.	D. W.	MEMORANDA.
1	F	
2	S	
3	S	
4	M	
5	Tu	
6	W	
7	Th	
8	F	
9	S	
10	S	
11	M	
12	Tu	
13	W	
14	Th	
15	F	
16	S	
17	S	
18	M	
19	Tu	
20	W	
21	Th	
22	F	
23	S	
24	S	
25	M	
26	Tu	
27	W	
28	Th	
29	F	
30	S	

MAY.

D. M.	D. W.	Remarkable Events.	Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. After.	Moon Sets. Morn.
1	S	3rd Sunday after Easter	4 34	7 21	1 42	2 14
2	M		4 33	7 22	2 58	2 29
3	Tu		4 31	7 23	4 18	2 45
4	W	Senebier b. 1742	4 29	7 25	5 42	3 2
5	Th	J. W. Draper b. 1811	4 27	7 27	7 9	3 23
6	F	Humboldt d. 1859. ○ 6.34 M.	4 26	7 29	8 35	3 50
7	S		4 24	7 30	9 57	4 27
8	S	4th S. af. East. Peroxide of H. rec.	4 22	7 32	11 4	5 19
9	M	[for rem. of Hypo,'66. P. Meagher	4 20	7 33	11 54	6 26
10	Tu	S. London Pho. Soc. f. '59 [d. '97	4 19	7 35	Morn	7 45
11	W	Becquerel d. 1891	4 17	7 36	0 30	9 10
12	Th	Sir John Herschel d. 1871. ☾ 9.36 A.	4 16	7 38	0 57	10 35
13	F	Justus von Liebig b. 1803	4 14	7 39	1 16	11 56
14	S	Fahrenheit b. 1686	4 13	7 41	1 33	After
15	S	Rogation Sunday [d. 1887	4 11	7 42	1 48	2 28
16	M	C. Breese d. 1875. Major C. Russell	4 10	7 44	2 3	3 42
17	Tu	Association Belge founded, 1874	4 8	7 45	2 19	4 55
18	W		4 7	7 47	2 38	6 7
19	Th	Ascension Day.	4 5	7 48	3 0	7 18
20	F	● 0.58 A.	4 4	7 50	3 28	8 24
21	S	Scheele d. 1786	4 2	7 51	4 3	9 22
22	S	Sunday after Ascension Day	4 1	7 53	4 48	10 11
23	M	B. J. Sayce d. 1895	4 0	7 54	5 42	10 50
24	Tu		3 59	7 55	6 45	11 20
25	W		3 58	7 56	7 52	11 43
26	Th	H. B. Berkeley d. 1890	3 57	7 58	9 2	Morn
27	F		3 55	7 59	10 13	0 2
28	S	☽ 5.14 A.	3 54	8 0	11 24	0 19
29	S	Whit Sunday. Sir H. Davy d. 1829	3 53	8 1	After	0 34
30	M		3 53	8 3	1 54	0 48
31	Tu		3 52	8 4	3 13	1 4

MAY.

D. M.	D. W.	MEMORANDA.
1	S	*For* MEETINGS OF SOCIETIES, *see pp.* 574–623.
2	M	
3	Tu	
4	W	
5	Th	
6	F	
7	S	
8	S	
9	M	
10	Tu	
11	W	
12	Th	
13	F	
14	S	
15	S	
16	M	
17	Tu	
18	W	
19	Th	
20	F	
21	S	
22	S	
23	M	
24	Tu	
25	W	
26	Th	
27	F	
28	S	
29	S	
30	M	
31	Tu	

JUNE.

D. M.	D. W.	REMARKABLE EVENTS.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	W		3 51	8 5	4 37	1 22
2	Th	Niepce pubsh. his *Heliochromic Pro-*	3 50	8 6	6 3	1 46
3	F	[*cesses*, 1851	3 49	8 7	7 28	2 18
4	S	Tessié du Mothay d. 1880. ○ 2.11 A.	3 48	8 8	8 44	3 2
5	S	Trinity Sunday	3 47	8 9	9 44	4 3
6	M		3 47	8 10	10 27	5 20
7	Tu	Fraunhofer d. 1826	3 46	8 10	10 57	6 47
8	W		3 46	8 11	11 21	8 15
9	Th	Alvan Clark d. 1897	3 45	8 12	11 39	9 40
10	F	[1853. ☾ 6.4 M.	3 45	8 13	11 55	11 0
11	S	Cutting's American Bromide pat.	3 45	8 13	Morn	After
12	S	1st Sunday after Trinity	3 45	8 14	0 11	1 33
13	M		3 45	8 15	0 26	2 46
14	Tu	Partnership between Daguerre and	3 45	8 16	0 43	3 58
15	W	[Niepce, 1837	3 44	8 16	1 4	5 9
16	Th	Chrysotype and Cyanotype Process	3 44	8 17	1 30	6 16
17	F	[com. to Royal Society, 1842	3 44	8 17	2 3	7 17
18	S		3 44	8 17	2 45	8 9
19	S	2nd Sunday after Trinity. Abbé	3 44	8 17	3 36	8 50
20	M	[Laborde d. 1883. ● 4.19 M.	3 44	8 18	4 36	9 23
21	Tu	Niepce Memorial uncov. at Chalons,	3 45	8 18	5 42	9 48
22	W	[1885	3 45	8 18	6 51	10 8
23	Th		3 45	8 18	8 2	10 25
24	F	Hardwich d. 1890	3 45	8 19	9 13	10 40
25	S	[bury b. 1834. Liesegang b. 1839	3 46	8 19	10 24	10 55
26	S	3rd S. aft. Trinity. W. B. Wood-	3 46	8 19	11 36	11 10
27	M	Herr Wothly d. 1873. G. Price d.	3 46	8 19	After	11 26
28	Tu	[1870. ☽ 4.54 M.	3 46	8 19	2 12	11 45
29	W	Ferrous-oxalate Developer pub. 1877	3 47	8 19	3 35	Morn
30	Th		3 48	8 18	4 59	0 12

NOTICE OF REMOVAL.

THE OFFICES of the 'British Journal of Photography,' and 'British Journal Photographic Almanac and Photographer's Daily Companion,' and 'Lantern Record Supplement,' will be

REMOVED ON JANUARY 1st, 1898,

to Larger and more Convenient Premises at

24 WELLINGTON STREET, STRAND, LONDON.

[*See page* 558.

JUNE.

D. M.	D. W.	MEMORANDA.
1	W	*For* MEETINGS OF SOCIETIES, *see pp.* 574–623.
2	Th	
3	F	
4	S	
5	S	
6	M	
7	Tu	
8	W	
9	Th	
10	F	
11	S	
12	S	
13	M	
14	Tu	
15	W	
16	Th	
17	F	
18	S	
19	S	
20	M	
21	Tu	
22	W	
23	Th	
24	F	
25	S	
26	S	
27	M	
28	Tu	
29	W	
30	Th	

JULY.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	Sets. H. M.	MOON. Rises. After.	Sets. Morn.
1	F		3 49	8 18	6 19	0 49
2	S		3 49	8 18	7 26	1 40
3	S	4th Sun. after Trinity. ○ 9.12 A.	3 50	8 18	8 18	2 49
4	M		3 51	8 17	8 55	4 13
5	Tu	Nicephore Niepce d. 1833	3 52	8 17	9 21	5 44
6	W		3 52	8 16	9 43	7 13
7	Th		3 53	8 16	10 1	8 38
8	F		3 54	8 15	10 16	9 59
9	S		3 55	8 14	10 32	11 18
10	S	5th Sun. after Trinity. Daguerre	3 56	8 13	10 50	After
11	M	[d. 1851. ☾ 4.43 A.	3 57	8 13	11 9	1 47
12	Tu	Wedgwood b. 1730. G. Dawson d.	3 58	8 12	11 33	3 0
13	W	Abbé Moigno d. 1884 [1897	3 59	8 11	Morn	4 9
14	Th	Dumas b. 1800	4 0	8 10	0 4	5 12
15	F		4 2	8 9	0 43	6 6
16	S	Claudet b. 1797	4 3	8 8	1 32	6 51
17	S	6th Sunday after Trinity	4 4	8 7	2 29	7 26
18	M	V. M. Griswold (Inv. Ferrotype) d.	4 5	8 6	3 34	7 53
19	Tu	[1872. ● 7.47 A.	4 7	8 5	4 42	8 15
20	W	Collodion Pos. Process pub. 1852	4 8	8 3	5 52	8 33
21	Th	Regnault b. 1810	4 9	8 2	7 3	8 49
22	F		4 10	8 1	8 14	9 3
23	S		4 12	8 0	9 26	9 18
24	S	7th Sun. after Trinity. Captain	4 13	7 58	10 40	9 33
25	M	[Abney b. 1843	4 14	7 57	11 56	9 51
26	Tu	Niepce de St. Victor b. 1806. ☽ 1.40 A.	4 15	7 56	After	10 14
27	W		4 17	7 55	2 36	10 44
28	Th		4 18	7 53	3 55	11 27
29	F	Secchi b. 1818	4 20	7 52	5 8	Morn
30	S	[b. 1800	4 21	7 50	6 6	0 26
31	S	8th Sun. after Trinity. Wohler	4 23	7 48	6 49	1 41

JULY.

D. M.	D. W.	MEMORANDA.
1	F	*For* MEETINGS OF SOCIETIES, *see pp.* 574–623.
2	S	
3	S	
4	M	
5	Tu	
6	W	
7	Th	
8	F	
9	S	
10	S	
11	M	
12	Tu	
13	W	
14	Th	
15	F	
16	S	
17	S	
18	M	
19	Tu	
20	W	
21	Th	
22	F	
23	S	
24	S	
25	M	
26	Tu	
27	W	
28	Th	
29	F	
30	S	
31	S	

AUGUST.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.		SUN. Sets. H. M.		MOON. Rises. After		MOON. Sets. Morn.	
1	M		4	25	7	47	7	20	3	8
2	Tu	Stromeyer b. 1776. ○ 4.29 M.	4	26	7	45	7	45	4	38
3	W	Mungo Ponton d. 1880	4	28	7	43	8	4	6	7
4	Th		4	29	7	41	8	21	7	32
5	F	Wollaston b. 1766	4	31	7	40	8	37	8	54
6	S		4	32	7	38	8	54	10	13
7	S	9th Sun. after Trinity. Berzelius	4	34	7	36	9	14	11	30
8	M	Roger Fenton d. 1869 [d. 1848	4	35	7	34	9	36	After	
9	Tu	☾ 6.13 M.	4	37	7	33	10	4	1	56
10	W	W. H. Harrison d. 1897	4	38	7	31	10	41	3	2
11	Th		4	40	7	29	11	26	4	0
12	F		4	41	7	27	Morn		4	48
13	S	Prof. Stokes b. 1819	4	43	7	25	0	20	5	27
14	S	10th S. aft. Trinity. Daguerreo-	4	44	7	23	1	23	5	57
15	M	[type Process pat. 1839	4	46	7	21	2	31	6	21
16	Tu	Lavoisier b. 1743	4	48	7	19	3	41	6	40
17	W	● 10.34 M.	4	50	7	17	4	52	6	56
18	Th	Dr. Woodward (photo-microscopist)	4	51	7	15	6	4	7	11
19	F	[d. 1884	4	53	7	13	7	16	7	26
20	S		4	54	7	11	8	29	7	42
21	S	11th S. after Trinity. Chevreul	4	56	7	9	9	45	7	59
22	M	[b. 1786	4	57	7	7	11	3	8	20
23	Tu		4	59	7	5	After		8	47
24	W	Cutting (Introd. of Ambrotype) d.	5	0	7	3	1	41	9	24
25	Th	Faraday d. 1867 [1867. ☽ 8.32 A.	5	2	7	1	2	55	10	15
26	F	Paul Pretsch d. 1873. Daguerre Mem.	5	3	6	58	3	56	11	21
27	S	[uncovered, 1883	5	5	6	56	4	43	Morn	
28	S	12th Sunday after Trinity	5	7	6	54	5	19	0	41
29	M		5	9	6	52	5	47	2	8
30	Tu	Oliver Sarony d. 1879	5	10	6	50	6	7	3	36
31	W	Helmholtz b. 1821. ○ 0.51 A.	5	11	6	47	6	25	5	2

AUGUST.

D. M.	D. W.	MEMORANDA.
1	M	*For* MEETINGS OF SOCIETIES, *see pp.* 574–623.
2	Tu	
3	W	
4	Th	
5	F	
6	S	
7	S	
8	M	
9	Tu	
10	W	
11	Th	
12	F	
13	S	
14	S	
15	M	
16	Tu	
17	W	
18	Th	
19	F	
20	S	
21	S	
22	M	
23	Tu	
24	W	
25	Th	
26	F	
27	S	
28	S	
29	M	
30	Tu	
31	W	

SEPTEMBER.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. After.	Moon. Sets. Morn.
1	Th	Norris's Dry-plate Process pat. 1856	5 13	6 45	6 41	6 26
2	F		5 15	6 43	6 58	7 47
3	S	[bury d. 1885	5 17	6 41	7 17	9 6
4	S	13th Sun. after Trinity. Wood-	5 18	6 39	7 39	10 23
5	M	Pantascopic Camera pat. 1862	5 20	6 37	8 6	11 37
6	Tu	[1885. ☾ 10.51 A.	5 21	6 34	8 39	After
7	W	Poitevin Memorial inaugurated,	5 23	6 32	9 21	1 50
8	Th	Gel.-bro. Pro. pub. by Maddox, 1871	5 24	6 30	10 12	2 42
9	F	Col.-bro. Pro. pub. 1864	5 26	6 28	11 13	3 24
10	S		5 27	6 25	Morn	3 57
11	S	14th Sunday after Trinity	5 29	6 23	0 18	4 23
12	M		5 31	6 20	1 27	4 44
13	Tu		5 33	6 18	2 38	5 2
14	W	Humboldt b. 1769	5 34	6 16	3 50	5 18
15	Th	Petzval d. 1891	5 36	6 14	5 2	5 33
16	F	● 0.10 M.	5 37	6 11	6 15	5 49
17	S	Fox Talbot d. 1877	5 39	6 9	7 31	6 6
18	S	15th S. after Trinity. Leon Fou-	5 40	6 7	8 50	6 26
19	M	T. Grubb d. 1878 [cault b. 1819	5 42	6 5	10 10	6 52
20	Tu	Talbot's Discovery of Develop. 1840	5 43	6 2	11 30	7 26
21	W	Stas b. 1813	5 45	6 0	After	8 12
22	Th	Faraday b. 1791. Thos. Sutton b. '19	5 47	5 57	1 49	9 13
23	F	Woodbury Pro. pat. 1864. ☽ 2.39 M.	5 49	5 55	2 40	10 26
24	S	J. G. Tunny d. 1887	5 50	5 53	3 18	11 49
25	S	16th Sun. after Trinity. Dr. Van	5 52	5 51	3 47	Morn
26	M	[Monckhoven b. 1834, d. 1882	5 53	5 48	4 10	1 14
27	Tu	Kolbe b. 1818	5 55	5 46	4 29	2 38
28	W		5 56	5 44	4 47	4 1
29	Th	○ 11.11 A.	5 58	5 42	5 4	5 21
30	F	Balard (Discoverer of Bromine) b. [1802	6 0	5 39	5 22	6 41

SEPTEMBER.

D. M.	D. W.	MEMORANDA.
1	Th	*For* MEETINGS OF SOCIETIES, *see pp.* 574–623.
2	F	
3	S	
4	S	
5	M	
6	Tu	
7	W	
8	Th	
9	F	
10	S	
11	S	
12	M	
13	Tu	
14	W	
15	Th	
16	F	
17	S	
18	S	
19	M	
20	Tu	
21	W	
22	Th	
23	F	
24	S	
25	S	
26	M	
27	Tu	
28	W	
29	Th	
30	F	

OCTOBER.

D. M.	D. W.	Remarkable Events.	Sun. Rises. H. M.	Sun. Sets. H. M.	Moon. Rises. After.	Moon. Sets. Morn.
1	S		6 2	5 36	5 42	7 59
2	S	17th Sunday after Trinity. Arago	6 3	5 34	6 7	9 16
3	M	[d. 1853	6 5	5 32	6 38	10 28
4	Tu		6 6	5 30	7 16	11 35
5	W		6 8	5 28	8 4	After
6	Th		6 10	5 25	9 1	1 19
7	F	☾ 6.5 A.	6 12	5 23	10 4	1 56
8	S		6 13	5 21	11 12	2 24
9	S	18th Sunday after Trinity	6 15	5 19	Morn	2 47
10	M		6 16	5 17	0 21	3 6
11	Tu	H. T. Anthony d. 1884	6 18	5 15	1 32	3 23
12	W	Gmelin b. 1792	6 20	5 12	2 43	3 38
13	Th		6 22	5 10	3 56	3 54
14	F		6 23	5 8	5 11	4 11
15	S	● 0.37 A.	6 25	5 6	6 29	4 31
16	S	19th Sun. after Trinity [1887	6 27	5 4	7 50	4 55
17	M	Reaumur d. 1757. Robert Hunt d.	6 29	5 2	9 13	5 27
18	Tu	Schonbein b. 1799. Wheatstone d.	6 30	4 59	10 31	6 11
19	W	[1875	6 32	4 57	11 40	7 8
20	Th		6 34	4 55	After	8 18
21	F		6 36	4 53	1 19	9 38
22	S	☽ 9.9 M.	6 37	4 51	1 50	11 1
23	S	20th Sunday after Trinity	6 39	4 49	2 14	Morn
24	M		6 41	4 47	2 34	0 24
25	Tu	Vernon Heath d. 1895	6 43	4 45	2 52	1 45
26	W		6 44	4 43	3 9	3 4
27	Th		6 46	4 41	3 26	4 22
28	F	Col.-chlo. of Silver Process pub. 1864	6 48	4 39	3 45	5 39
29	S	Talbot Photo-eng. Process pat. 1852.	6 50	4 37	4 8	6 55
30	S	21st Sun. after Trinity [○ 0.18 A.	6 51	4 35	4 37	8 9
31	M		6 53	4 33	5 12	9 18

OCTOBER.

D. M.	D. W.	MEMORANDA.
1	S	*For* MEETINGS OF SOCIETIES, *see pp.* 574–623.
2	S	
3	M	
4	Tu	
5	W	
6	Th	
7	F	
8	S	
9	S	
10	M	
11	Tu	
12	W	
13	Th	
14	F	
15	S	
16	S	
17	M	
18	Tu	
19	W	
20	Th	
21	F	
22	S	
23	S	
24	M	
25	Tu	
26	W	
27	Th	
28	F	
29	S	
30	S	
31	M	

NOVEMBER.

D. M.	D. W.	Remarkable Events.	SUN. Rises. H. M.	SUN. Sets. H. M.	MOON. Rises. After.	MOON. Sets. Morn.
1	Tu		6 55	4 31	5 57	10 20
2	W		6 57	4 30	6 51	11 11
3	Th		6 59	4 28	7 52	11 52
4	F		7 0	4 26	8 58	After
5	S	[b. 1771. ☾ 2.28 A.	7 2	4 25	10 6	0 48
6	S	22nd S. after Trinity. Senefelder	7 4	4 23	11 15	1 8
7	M	Dubois Raymond b. 1818	7 6	4 22	Morn	1 26
8	Tu	J. Traill Taylor d. 1895	7 7	4 20	0 24	1 42
9	W	Pretsch's Photo-engr. Pro. pat. 1854.	7 9	4 18	1 35	1 57
10	Th	Laroche d. 1886 [N. Sarony d. 1896	7 11	4 16	2 48	2 13
11	F	Willis's Aniline Process pat. 1864	7 13	4 15	4 4	2 32
12	S	[Turner d. 1896	7 14	4 13	5 24	2 54
13	S	23rd Sunday after Trinity. T. C.	7 16	4 12	6 46	3 24
14	M	● 0.21 M.	7 18	4 10	8 9	4 2
15	Tu		7 20	4 9	9 25	4 56
16	W	Lavater d. 1741	7 21	4 8	10 27	6 4
17	Th		7 23	4 7	11 16	7 24
18	F	Daguerre b. 1787	7 25	4 5	11 52	8 49
19	S		7 27	4 4	After	10 13
20	S	24th Sunday after Trinity. Prof.	7 28	4 3	0 40	11 34
21	M	[Draper d. 1882. ☽ 5.5 A.	7 30	4 2	0 58	Morn
22	Tu	Schlippe b. 1749	7 31	4 1	1 15	0 53
23	W	Harrison (Inv. of Globe Lens) d. 1864	7 33	4 0	1 32	2 10
24	Th		7 34	3 58	1 50	3 26
25	F		7 36	3 57	2 12	4 41
26	S	[1701	7 38	3 56	2 37	5 54
27	S	1st Sunday in Advent. Celsius b.	7 40	3 56	3 10	7 5
28	M	Sutton Panoramic Camera pat. 1859.	7 41	3 55	3 51	8 9
29	Tu	[○ 4.39 M.	7 43	3 54	4 42	9 4
30	W		7 44	3 53	5 41	9 48

NOVEMBER.

D. M.	D. W.	MEMORANDA.
1	Tu	*For* MEETINGS OF SOCIETIES, *see pp.* 574–623.
2	W	
3	Th	
4	F	
5	S	
6	S	
7	M	
8	Tu	
9	W	
10	Th	
11	F	
12	S	
13	S	
14	M	
15	Tu	
16	W	
17	Th	
18	F	
19	S	
20	S	
21	M	
22	Tu	
23	W	
24	Th	
25	F	
26	S	
27	S	
28	M	
29	Tu	
30	W	

DECEMBER.

D. M.	D. W.	Remarkable Events.	Sun Rises. H. M.	Sun Sets. H. M.	Moon Rises. After.	Moon Sets. Morn.
1	Th	Klaproth b. 1743	7 46	3 53	6 46	10 23
2	F		7 47	3 52	7 53	10 51
3	S		7 48	3 52	9 0	11 12
4	S	2nd Sunday in Advent. Galvani	7 49	3 51	10 8	11 30
5	M	[d. 1798. R. Kennett d. 1896	7 51	3 51	11 17	11 47
6	Tu	Obernetter's Chromo-photo. pat.	7 52	3 50	Morn	After
7	W	[1864. ☾ 10.6 M.	7 53	3 50	0 27	0 17
8	Th		7 54	3 49	1 40	0 34
9	F	Scheele b. 1742. Duc de Luynes d.	7 56	3 49	2 56	0 53
10	S	[1867	7 57	3 49	4 17	1 18
11	S	3rd S. in Advent. Sir D. Brewster	7 58	3 49	5 38	1 53
12	M	Rev. J. B. Reade d. 1870 [b. 1781	7 59	3 49	6 58	2 39
13	Tu	First Photo-enam. Proc. pat. 1854.	8 0	3 49	8 9	3 40
14	W	E. Anthony d. 1888 [● 11.43 M.	8 1	3 49	9 7	4 58
15	Th		8 2	3 49	9 49	6 24
16	F	H. Greenwood d. 1884. T. Ross d.	8 2	3 49	10 20	7 52
17	S	Sir Humphry Davy b. 1778 [1870	8 3	3 49	10 43	9 19
18	S	4th Sunday in Advent	8 4	3 50	11 3	10 40
19	M	Mawson k. 1867	8 5	3 50	11 21	11 59
20	Tu	☽ 3.22 M.	8 5	3 50	11 38	Morn
21	W		8 6	3 50	11 56	1 16
22	Th	Wollaston d. 1828	8 6	3 51	After	2 31
23	F		8 7	3 51	0 40	3 45
24	S		8 7	3 52	1 10	4 56
25	S	Christmas Day. Sir I. Newton b.	8 8	3 53	1 48	6 1
26	M	[1642	8 8	3 54	2 36	6 59
27	Tu	○ 11.39 A.	8 8	3 54	3 32	7 47
28	W	J. T. Goddard d. 1866	8 8	3 55	4 35	8 25
29	Th		8 8	3 56	5 41	8 54
30	F	J. H. Dallmeyer d. 1883	8 8	3 57	6 49	9 18
31	S	A. Braun d. 1877	8 9	3 58	7 57	9 37

DECEMBER.

D. M.	D. W.	MEMORANDA.
1	Th	*For* Meetings of Societies, *see pp.* 574–623.
2	F	
3	S	
4	S	
5	M	
6	Tu	
7	W	
8	Th	
9	F	
10	S	
11	S	
12	M	
13	Tu	
14	W	
15	Th	
16	F	
17	S	
18	S	
19	M	
20	Tu	
21	W	
22	Th	
23	F	
24	S	
25	S	
26	M	
27	Tu	
28	W	
29	Th	
30	F	
31	S	

WEIGHTS AND MEASURES.

APOTHECARIES' WEIGHT.

SOLID MEASURE.

20 Grains	=	1 Scruple	=	20 Grains.
3 Scruples	=	1 Drachm	=	60 "
8 Drachms	=	1 Ounce	=	480 "
12 Ounces	=	1 Pound	=	5760 "

FLUID.

60 Minims	=	1 Fluid Drachm.
8 Drachms	=	1 Ounce.
20 Ounces	=	1 Pint.
8 Pints	=	1 Gallon.

The above weights are those usually adopted in formulæ.

All Chemicals are usually sold by Avoirdupois Weight, in which there are 437½ grains to the ounce.

The Precious Metals, such as Silver and Gold, are sold by Troy Weight, containing 480 grains to the ounce.

FRENCH WEIGHTS AND MEASURES,

AND THEIR EQUIVALENTS IN ENGLISH.

1 Cubic Centimètre	=	17 minims nearly.
3½ " "	=	1 drachm.
28·4 " "	=	1 ounce.
50 " "	=	1 ounce, 6 drachms, 5 minims.
100 " "	=	3 ounces, 4 drachms, 9 minims.
1000 " " or 1 litre, = to 61 cubic inches	=	35 ounces, 1 drachm, 36 minims.

The unit of French liquid measures is a cubic *centimètre.*

A cubic *centimètre* of water measures nearly 17 minims (16·896); it weighs 15·4 grains, or 1 *gramme*. A cubic *inch* of water weighs 252·5 grains.

The unit of French weights is the gramme = 15·4 grains; thus a drachm (60 grains) is nearly 4 grammes (3·88). An easy way to convert grammes into English weight is to divide the sum by 4, which gives the equivalent in drachms very nearly thus:—

Grammes.				Drachms.		Oz.		Drachm.		Grains.
100	÷	4	=	25	=	3	.	1	+	48

THE METRICAL SYSTEM.

By George Fernau.

In the appended comparative tables of British and metrical weights and measures, the following metrical units and their equivalents have been adopted as the basis of calculation, viz.:—

The Metre.

The metre, as a unit of *length*, represents the ten-millionth part of a meridian, drawn from the Pole to the Equator. A centimetre, as the name implies, is the hundredth part of a metre; and a kilometre is equal to one thousand metres.

1 Metre = 39·371 inches.
1 Yard = 0·914 metre.
1 Mile = 1·609 kilometres.

The Litre.

The litre, as the unit of *capacity*, represents the cube of a tenth part of a metre, a cubic centimetre (c. c.) thus being the thousandth part of a litre.

1 Litre = 1·761 pints.
1 Gallon = 1·543 litres.

The Gramme.

The gramme, as the unit of *weight*, corresponds to the thousandth part of the weight of a litre of distilled water at its greatest density. One thousand grammes represent one kilogramme.

1 Gramme = 15·432 grains.
1 Grain = 0·065 grammes.
1 Pound (avoirdupois) = 0·454 kilogrammes.
1 Hundredweight = 50·800 ,,

General Remarks.

Centimetres, metres, and kilometres, grammes and kilogrammes, and litres and millimetres (millimetres are usually called, for the measure of capacity, cubic centimetres, c. c.), are, as a rule, in the metrical system, and more especially for photographical purposes, the only weights and measures used on the Continent; the kilometres, kilogrammes, and litres for large quantities, and the subdivisions for small quantities. On such usage our tables are made out.

COMPARATIVE TABLES

OF BRITISH AND METRICAL WEIGHTS AND MEASURES FOR THE USE OF PHOTOGRAPHERS.

Troy and Apothecaries'.

BRITISH.		METRICAL.		METRICAL.	BRITISH.		
Weights and Measures.	Solid or Fluid.	Weights and Measures. Wholes and Thousandths.		Weights and Measures.		Solid or Fluid.	Wholes and Thousandths.
One		Equal to, in :		One	Equal to, in :		
Grain ...	Solid	Grammes	0·065	Gramme ...	Grains	Solid	15·432
Scruple .	,,	,,	1·296	,, ...	Scruples	,,	0·772
Drachm	,,	,,	3·888	,, ...	Drachms	,,	0·257
,,	Fluid	c. c.	3·544	C. c.	,,	Fluid	0·282
Minim...	,,	,,	0·059	,, ...	Minims	,,	16·920
Ounce ...	Solid	Grammes	31·104	Gramme ...	Ounces	Solid	0·032
,,	Fluid	c. c.	28·350	C. c.	,,	Fluid	0·035
Pound...	Solid	Kilogrammes	0·373	Kilogramme	Pounds	Solid	0·681
Pint ...	Fluid	Litres	0·568	Litre	Pints	Fluid	1·760
Quart ...	,,	,,	1·136	,, ...	Quarts	,,	0·880
Gallon...	,,	,,	4·543	,, ...	Gallons	,,	0·220

Avoirdupois or Imperial.

BRITISH.		METRICAL.		METRICAL.	BRITISH.		
Drachm	Solid	Grammes	1·772	Gramme ...	Drachms	Solid	0·564
Ounce ...	,,	,,	28·350	,, ...	Ounces	,,	0·035
,,	Fluid	c. c.	28·350	C. c.	,,	Fluid	0·035
Pound...	Solid	Kilogrammes	0·454	Kilogramme	Pounds	Solid	2·205
Pint ...	Fluid	Litres	0·568	Litre	Pints	Fluid	1·760
Quart ...	,,	,,	1·136	,, ...	Quarts	,,	0·880
Gallon...	,,	,,	4·543	,, ...	Gallons	,,	0·220
Inch ...	Linear	Metres	0·025	Metre	Inches	Linear	39·370
Foot ...	,,	,,	0·305	,, ...	Feet	,,	3·278
Yard ...	,,	,,	0·914	,, ...	Yards	,,	1·094
Mile ...	,,	Kilometres	1·609	Kilometre ..	Miles	,,	0·622

HOW TO USE THE TABLES.

The last column in both tables represents the multiplying term for any unit in either system of weights and measures. Thus, 1 drachm, fluid (troy), being 3·544 cubic centimetres (c. c.), 6 drachms will be 6 × 3·544, or 21·264 c. c., or $21\frac{1}{4}$ c. c. more or less. In the same way, 1 drachm, solid (avoirdupois), being 1·772 grammes, 6 drachms will be 6 × 1·772, or 10·632, or $10\frac{5}{8}$ grammes more or less. As examples in the other table, 1 gramme being 15·432 grains, 10 grammes will be 154·32 grains; or 1 gramme being 0·035 ounce, solid (avoirdupois), 100 grammes will be 3·50 ounces, or $3\frac{1}{2}$.

VALUE OF BRITISH WEIGHTS AND MEASURES.

Troy and Apothecaries'.

1 Drachm, solid	= 3 scruples		= 60 grains.		
1 ,, fluid	= 60 minims		= $54\frac{1}{2}$,,		
1 Ounce, solid	= 8 drachms		= 480 ,,		
1 ,, fluid	= 8 ,,	fluid	= $437\frac{1}{2}$,,		
1 Pound, solid	= 12 ounces		= 96 drachms		= 5760 grains.
1 Pint, fluid	= 20 ,,	fluid	= 160 drachms, fluid		= 8750 ,,

Avoirdupois or Imperial.

1 Drachm	= 27·344 grains.		
1 Pound	= 16 ounces	= 256 drachms	= 7000 grains.
1 Pint	= 20 ,, fluid	= 8750 grains.	
1 Yard	= 3 feet	= 36 inches.	
1 Mile	= 1760 yards.		

Grains, whether troy, apothecary, or avoirdupois, are all equal in weight.

RULES OF THE PHOTOGRAPHIC CLUB.

[We frequently receive requests, from those engaged in the formation of new Photographic Societies, for information concerning the Rules that are necessary. The Rules of the Photographic Club, here appended, will be found an admirable basis to work on.]

I.—The Photographic Club is formed for the purpose of enabling its Members to discuss technical details connected with photography in a social manner.

II.—The Officers of the Club, hereinafter called the Committee, shall consist of two Trustees, Treasurer, Secretary, Recorder, Curator, Librarian, and eight other Members of Committee, five of whom shall form a quorum. The offices of Treasurer and Secretary may be merged into one at the discretion of the Committee.

III.—The Committee shall make such Bye-laws and Regulations (not inconsistent with the Rules) as they may from time to time think necessary.

IV.—The Committee shall have the power to appoint Sub-Committees, for special objects, from the Members of the Club.

V.—A Chairman shall be nominated each evening to preside at the next Meeting of the Club, and, should such proposed Chairman be absent, the Members present shall elect a Chairman on that night.

VI.—The Club shall be opened at 7: one hour, 8 to 9, each evening shall be devoted to the discussion of technical business; the remainder of the evening to social purposes. The Chairman to have the control of the Meeting only during the time devoted to technical business.

VII.—The accounts of the Club shall be audited annually by two Auditors, to be elected from the Members of the Club at the Meeting,

twenty-eight days prior to the Annual General Meeting. No Officer or Member of Committee to be eligible to act as Auditor.

VIII.—The Officers of the Club shall retire annually, but shall be eligible for re-election, if nominated; but no ordinary Member of the Committee shall be eligible for re-election, after serving three consecutive years, until after a lapse of one year. Names of gentlemen proposed as Officers shall be posted on the notice-board fourteen days previous to the Annual General Meeting. Should any Officer resign, or become incapable of acting, the Committee may, at their next Meeting, proceed to fill up the vacancy thereby occasioned.

IX.—There shall be an Annual General Meeting of the Club, held the first Wednesday in November in every year, for the purpose of receiving the Balance-sheet for the past year and the Report of the Committee, the election of Officers (such election to be by ballot, and not by show of hands), and also for any other business in connexion with the Club that may require the decision of a General Meeting. Notice of the Meeting to be sent by post to each Member fourteen days before the date of such Annual General Meeting.

X.—No subject that does not relate to the management of the Club shall be brought forward at the Annual General Meeting; and no alteration in the Rules shall be proposed of which fourteen days' notice shall not have been given.

XI.—A Special General Meeting of the Club shall be called by the Secretary upon the requisition of twelve Members, such requisition to be placed on the notice-board fourteen days before the date of the Special Meeting, the Special Meeting to be held on the usual Meeting night of the Club, after 9 o'clock; but no subject shall be discussed thereat except that stated on the requisition calling the Meeting.

XII.—All Candidates for Membership shall be proposed and seconded by two Members of the Club, the name of each Candidate, his proposer and seconder, to be posted on the board fourteen days before being balloted for; one black ball in five to exclude. The election of a new Member shall be notified to him in writing, with a request for the payment of his subscription. No Member shall be entitled to enjoy the advantages of, or in any way use, the Club until his subscriptions for the current year be paid. Members shall have the power of electing Honorary Members nominated by the Committee, who shall enjoy the privileges of the Club, but not the power of voting on any subject whatever, or holding any office.

XIII.—The Annual Subscriptions for Town Members shall be One Guinea, payable in advance, to the Treasurer, on the first Wednesday in November in each year. Members residing not less than fifteen miles from London (the General Post Office) shall be considered Country Members, and shall pay a subscription of half-a-guinea per annum so long as they continue so to reside; but no Member having a photographic business within that radius shall be considered a Country Member. Members joining the Club before the 31st of January shall pay the full subscription. After the end of January and before the 31st of May, the payment shall be two-thirds; afterthe end of May and before the 30th of September, one-third; the subscription of any Member elected after the 30th of September shall be considered payment for the following year.

XIV.—The payment by a Member of 10*l.* 10*s.* in one sum shall constitute Life Membership; but the number of Life Members shall not exceed five. Candidates for Life Membership shall be accepted in priority of application.

XV.—All subscriptions are due on the first Wednesday in November of each year, and, if not paid within one month, the Secretary shall write to the Member requesting payment, and, if the subscription be not then paid within one month, the Committee shall have power to remove the name from the list of Members.

XVI.—Each Member shall communicate any change of address to the Secretary, and all notices sent to such address shall be considered as duly delivered.

XVII.—The Secretary shall be required to keep proper books of accounts, together with a minute-book. The books of the Club, except the minute-book of the Committee, shall be open to the inspection of the Members on every night of Meeting.

XVIII.—Members shall be at liberty to introduce Visitors to the Meetings of the Club, but the Committee shall have the power to limit the number of such Visitors. An attendance-book shall be kept in which Members and Visitors present at each Meeting shall sign their names.

XIX.—Any Member making himself obnoxious to the Members of the Club shall be reported to the Committee, who shall investigate and, if necessary, call a Special Meeting of the Club to discuss the matter; then, if the majority so decide, the offending Member shall be expelled from the Club, and lose all interest or benefit in it, such decision to be taken by ballot, and not by show of hands.

XX.—A copy of these Rules shall be delivered to every Member, on election, by the Secretary; but no Member shall be absolved from the effects of the Rules on the plea of not having received it.

XXI.—In the event of any one being elected a Member of this Club, and not having paid his subscription in accordance with Rules XIII. and XV., he shall not be eligible for re-election unless he can show just cause to the Committee for such non-payment.

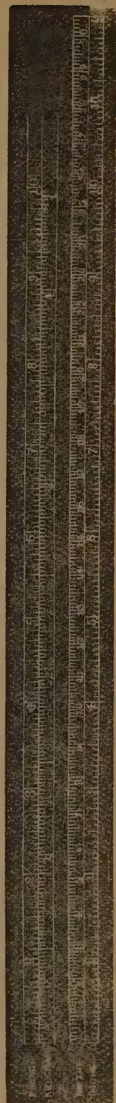
Advertisement Scale, see page 1396.
Subscription Scale, see page 1221.

CONVERSION OF GRAINS AND OUNCES INTO GRAMMES.

	Grains to Grammes.	Ounces to Grammes.	Grains to the Ounce=Grammes to 100 c.c.
1	0·06479	28·3495	0·22817
2	0·12958	56·9660	0·45635
3	0·19437	85·0485	0·68452
4	0·25916	113·3980	0·91269
5	0·32395	141·7475	1·14086
6	0·38874	170·0970	1·36904
7	0·45353	198·4465	1·59721
8	0·51832	226·7960	1·82538
9	0·58311	255·1455	2·05356

CONVERSION OF MINIMS, DRACHMS, OUNCES, AND PINTS TO CUBIC CENTIMETRES AND LITRES.

	Minims to c.c.	Drachms to c.c.	Ounces to c.c.	Pints to Litres.
1	0·05916	3·5495	28·396	0·56792
2	0·11832	7·0990	56·792	1·13584
3	0·17748	10·6485	85·188	1·70376
4	0·23664	14·1980	113·584	2·27168
5	0·29580	17·7475	141·980	2·83960
6	0·35496	21·2970	170·376	3·40752
7	0·41412	24·8465	198·772	3·97544
8	0·47328	28·3960	227·168	4·54336
9	0·53244	31·9455	255·564	5·11128



PHOTOGRAPHIC SOCIETIES OF THE UNITED KINGDOM.

Aberdeenshire Amateur Photographic Society.—(ESTABLISHED 1891.)—Meetings held at 77 George Street, Aberdeen. *President*—James Main. *Vice-Presidents*—W. T. Borthwick and James Glass. *Committee*—A. Duff, W. Thomson, G. R. Hunter, L. G. Jamieson, Dr. Coutts, G. Ford, L. M. Gibb. *Treasurer*—James Davidson. *Secretary*—Alexander Pend.r, 37 Belmont Street, Aberdeen.

Accrington and District Camera Club.—(ESTABLISHED 1892.)—*President*—Dr. Clayton. *Vice-Presidents*—A. Barnes, W. J. Cheney, W. Clayton, T. Stanley. *Committee*—J. Barnes, F. Bradshaw, A. Greenwood, J. A. Hanson, J. R. Hitchon, W. Kenyon. *Secretary and Treasurer*—Isaac Hanson, Rothwell Heights, Accrington.

Affiliation of Photographic Societies.—(ESTABLISHED 1892.)—Meetings held at 12 Hanover Square, London, W. *Chairman*—W. Thomas. *Committee*—Consists of two Delegates from each of the Societies, with three from the Royal Photographic Society. *Treasurer*—George Scamell. *Secretary*—R. Child Bayley, 12 Hanover Square, London, W.

Aintree Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Aintree Institute, Aintree, Liverpool. *President*—C. H. Adkins. *Vice-Presidents*—W. H. Lloyd and W. Lockier. *Committee*—G. Ashley, J. H. Farmer, C.C., C. F. Inston, D. J. Neill, J. Harris, E. P. Heron, W. B. Hellon, R. M. Owen, C. H. Shafto, R. Bootle, J. Wilson. *Treasurer*—D. J. Kidd. *Secretary*—Ralph Walker, 1 Alexandra Drive, Aintree. *Assistant Secretary*—D. Travis.

Aldenham Institute Camera Club.—(ESTABLISHED 1889.)—Meetings held at the Aldenham Institute, Goldington Crescent, Pancras Road, N.W. *Secretary*—E. Pringle, Aldenham Institute, Goldington Crescent, Pancras Road, N.W.

Altrincham Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Technical School, Altrincham. *President*—J. Taylor Hughes. *Vice-President*—F. W. Parrott. *Committee*—Messrs. Gibb, Jones, and Wright. *Treasurer*—J. Drinkwater. *Secretary*—C. P. Bahin, 19 Clifton Avenue, Altrincham.

Amateur Photographic Field Club.—(ESTABLISHED 1858.)—*President*—H. P. Robinson. *Hon. Secretary*—Francis Cobb, 79 Cornhill, E.C.

Amateur Photographic Association.—(Established 1869, Reorganized 1896.)—Offices: 182 Regent Street, W. *President*—His Royal Highness the Prince of Wales. *Vice-Presidents*—His Royal Highness the Duke of Cambridge, K.G., His Highness the Duke of Teck, G.C.B., &c., His Grace the Archbishop of York, His Grace the Duke of Newcastle, the Right Hon. the Earl of Rosse, F.R.S., the Right Hon. the Earl of Warwick, General the Right Hon. the Lord De Ros, James Glaisher, F.R.S., F.R.A.S., &c. *Council*—The Right Hon. the Viscount Maitland, the Hon. Dudley Leigh, the Hon. Henry Hussey Vivian, Sir J. Whittaker Ellis, Bart., M.P., Charles Stephens, M.A., Oxon., Walter Wood, F.R.G.S., W. S. Hobson, Robert O. Milne. *Hon. Secretary*—Henry Van der Weyde, 182 Regent Street, W.

Arbroath Amateur Photographic Society.—(Established 1890.)—Meetings held at the Y.M.C.A. Rooms. *President*—George G. Dalgarno. *Vice-Presidents*—Robert Moodie and Robert Davidson. *Committee*—D. Young, Andrew Scott, D. D. Calder, James Whyte. *Treasurer*—George K. Reid. *Secretary*—James Hood, 94 High Street, Arbroath.

Ashton-under-Lyne Photographic Society.—(Established 1891.)—Meetings held at Henry Square, Ashton-under-Lyne. *President*—Dr. Alexander Hamilton. *Vice-Presidents*—Major Bradley, Abel Buckley, J.P., T. Cheyne, Thomas Glazebrook, J. W. Kenworthy, J.P., C. Lord, C. E. Redfern, J.P., John Wilson, J.P. *Committee*—W. C. Brown, E. H. Hampson, J. Hutchinson, T. F. Kershaw, J. T. Lees, S. Sharp, C. Taylor, S. Woolley. *Librarian*—Samuel A. Platt. *Treasurer*—Walter Leigh. *Secretary*—Robert T. Marsland, 24 Park Parade, Ashton-under-Lyne.

Aston Natural History and Photographic Society.—(Established 1892.)—Meetings held at Burlington Hall, High Street, Aston, on Thursdays, at Eight p.m. *President*—William Tylar. *Vice-President*—Councillor S. Fisher. *Committee*—Messrs. Brooks, Fletcher, Johnson, Lawden, Millward, Rallings, Sands, Taylor, and Wallis. *Treasurer*—J. W. Johnson. *Secretary*—F. W. Pilditch, 185 Bevington Road, Aston.

Banbury and District Photographic Society.—(Established 1893.)—Meetings held at the Municipal Technical Schools, Banbury. *Committee*—W. Potts, T. Blinkhorn, W. Wood, T. E. Orchard, J. A. Knight, J. Brummitt, A. Nicholson, N. G. Ffench. *Secretary and Treasurer*—Seymour H. Beale, Caerleon, Grimsbury, Banbury.

Barnsley and District Photographic Society.—(Established 1893.)—Meetings held at the Arcade Schools, George Yard, Barnsley. *President*—O. de Mirimonde. *Vice-Presidents*—A. R. Tomlin and T. Parkes, M.A. *Committee*—Messrs. Guest, Haigh, Coles, W. Taylor, J. G. Taylor, and Ogden. *Secretary and Treasurer*—Charles Robert Barham, Bond Road, Barnsley.

Barrow Naturalists' Field Club (Photographic Section).—(Established 1890.)—Meetings held at Cambridge Hall, Barrow. *President*—William Dunlop. *Viee-Presidents*—Messrs. Spencer and C. J. Weston. *Committee*—Messrs. Dunlop, Spencer, Weston, Walton, Bailey, Redhead, Timms, and Angus. *Treasurer*—F. W. Walton. *Secretary*—William J. Angus, 79 Greengate Street, Barrow.

Bath Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Royal Literary and Scientific Institution. *President*—George F. Powell. *Vice-Presidents*—E. J. Appleby and E. Lambert. *Committee*—Austin J. King, A. F. Perren, Colonel Sealy, the Very Rev. Monsignor Williams, Rev. E. A. Purvis, Dr. Norman, D. Prout Williams. *Secretary and Treasurer*—W. Middleton Ashman, 12A Old Bond Street, Bath.

Batley Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Technical School, Batley. *President*—P. Sheard. *Vice-Presidents*—J. J. Jubb and C. Naylor. *Treasurer*—A. Bagshaw. *Secretary*—H. Keighley, West House, Batley.

Belfast Y.M.C.A. Camera Club.—(ESTABLISHED 1889.)—Meetings held at Wellington Place, Belfast. *President*—F. Megarry, J.P. *Vice-Presidents*—William Strain, T. B. Scott, T. F. Bell, A. R. Hogg. *Committee*—E. Bingham, J. A. Pollock, T. Knox, A. George, H. Hill, W. McLean. *Secretary and Treasurer*—J. McCleery, Y.M.C.A., Wellington Place, Belfast. *Assistant Secretary*—H. Rew.

Beverley Photographic and Sketching Society.—(ESTABLISHED 1893.)—Meetings held in the Club Room, Butcher Row. *President*—Rev. F. J. Hall. *Vice-Presidents*—J. J. Harrison, J.P., E. R. B. Hall-Watt, J. A. Ridgway, F.R.A.S., Dr. Croke, Captain Forrest, Dr. Appleton, J.P., Rev. Canon Nolloth, D.D., Douglas Joy, Rev. J. C. W. Barnaby, M.A., G. Bohn, C.E. *Council*—Rev. W. E. Wigfall, Thomson Foley, T. B. Burton, G. Dawson, L. Hazelhurst, H. J. Mann. *Curator*—H. Mann. *Librarian*—T. J. Morley. *Secretary and Treasurer*—T. J. Morley, Toll Gavel, Beverley, Yorkshire.

Birkenhead Photographic Association.—(ESTABLISHED 1894.)—*President*—Edward Newall. *Vice-Presidents*—W. Shillinglaw and J. C. Threlfall. *Council*—J. W. Walton, W. H. Barlow, G. F. Prince, J. O. Cooper, R. J. Russell, T. J. Smith, W. H. Ralston. *Hon. Treasurer*—James Walker. *Hon. Secretary*—P. G. Rae, 13 James Street, Oxton.

Birmingham Natural History and Philosophical Society.—(ESTABLISHED 1858.)—Meetings held at Mason College, Birmingham. *President*—Prof. J. H. Poynting, M.A., D.Sc., F.R.S. *Vice-Presidents*—R. W. Chase, M.B.O.U., and T. Stacey Wilson, M.D., B.Sc. *Committee*—Prof. T. W. Bridge, M.A., Sc.D., Alfred Browett, John Edmonds, Prof. P. F. Frankland, Ph.D., B.Sc., F.R.S., Joseph Landon, F.G.S., John Levick, A. H. Martineau, W. E. Sumpner, D.Sc., T. H. Waller, H. Lloyd Wilson. *Treasurer*—C. A. Harrison. *Secretaries*—W. P. Marshall, Richmond Hill, Birmingham, and P. L. Gray, B.Sc., Assoc.R.C. Sc., Avenue House, Solihull, near Birmingham. *Assistant Secretary*—S. F. Bolton, 25 Balsall Heath Road, Birmingham.

Blairgowrie and District Photographic Association.—(ESTABLISHED 1894.—Meetings held at 7 Brown Street, Blairgowrie. *President*—Alexander Geekie. *Vice-Presidents*—Miss White and J. B. Maclachlan. *Committee*—W. G. Murray, G. Soutar, J. D. Petrie, D. G. Martin, Robert Whitton. *Treasurer*—James Richardson. *Secretary*—Thomas C. Gorrie, Beechbank, Rattray, Blairgowrie.

Birmingham Photographic Society.—(ESTABLISHED 1885.)—Meetings held at the Athletic Institute, John Bright Street, Birmingham. *President*—Sir J. Benjamin Stone, M.P., J.P., F.G.S., F.L.S., F.R.G.S., F.R.A.S. *Vice-Presidents*—G. F. Lyndon, J.P., W. Jones, E. C. Middleton, G. A. Thomason. *Committee*—W. Bateman, C. S. Baynton, P. T. Deakin, W. T. Greatbatch, T. W. Robinson, W. Rooke, T. Taylor, E. Underwood. *Hon. Librarian*—W. S. Horton. *Treasurer*—A. C. Gilbert. *Secretary*—C. J. Fowler, Court Mount, Erdington. *Assistant Hon. Secretary*—F. Lewis.

Bolton Mutual Photographic Society.—Headquarters, County Borough Technical School, Mawdsley Street, Bolton. *President*—Rev. G. H. Carnson. *Vice-Presidents*—James Norris, James Phethean, T. E. Turner. *Committee*—W. Crompton, Joseph Marsden, R. H. Patterson, Alexander Roscoe, John Rigby, Fred Wilkinson, F.G.S., G. Hodges, A. Knight, J. S. Rushton. *Hon. Treasurer*—Percy Farnworth. *Hon. Secretary*—Peter Woods.

Bolton Photographic Society.—(ESTABLISHED 1879.)—Meetings are held at the Society's Rooms, Rushton Street, Bolton. *President*—J. R. Bridson, J.P., &c. *Vice-Presidents*—B. H. Abbatt, W. Banks, R. Harwood, W. Knowles, J. Boothroyd, J. P. Haslam, J.P., R. Leigh, J. Taylor, C. K. Dalton. *Treasurer*—C. K. Dalton. *Secretary*—T. H. Heyes, 150 Deansgate, Bolton.

Bolton Society of Professional Photographers.—Meetings first Tuesday in each month, at Hamer's Commercial Hotel. *President*—W. Weatherley. *Hon. Secretary*—N. S. Kay, 55 Knowsley Street, Bolton.

Bootle Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at 188 Strand Road, Bootle. *President*—T. Pinnington. *Vice-Presidents*—E. T. Cockerhan, G. Y. Tickle, J.P., Captain Sibthorpe, W. R. Brewster. *Council*—E. J. McHarg, G. E. Wilkinson, A. B. Charters, R. C. Bond, J. Parke, C. St. C. Crawley, H. S. Frant, H. B. Taylor, H. Wyatt. *Treasurer*—W. T. Wright. *Secretary*—H. G. Page, 188 Strand Road, Bootle.

Borough Polytechnic Photographic Society.—(ESTABLISHED 1895.)—Meetings held at 103 Borough Road, S.E. *President*—Edric Bayley, L.C.C. *Vice-Presidents*—Rev. A. W. Jephson, M.A., C. J. Whittuck Rabbits, J.P., Walter A. Wigram. *Committee*—H. Heath, W. Cubridge, H. J. Blane, M. J. Lindsey, A. H. Boyce, A. J. Bulloch, W. Mundy. *Treasurer*—L. E. Cotterell. *Secretary*—F. W. Bannister, 103 Borough Road, S.E. *Assistant Secretary*—H. C. Philcox.

Bournemouth Photographic Society.—(ESTABLISHED 1890, REORGANIZED 1895.)—Headquarters, Athenæum Chambers, Town Hall Avenue. *President*—Dr. Hyla Greves. *Vice-Presidents*—J. W. Bennett and A. Youngman. *Committee*—J. Stanley, R. Toop, E. Harrison, C. Riddle, J. H. Woodward. *Hon. Treasurer*—William Jones. *Hon. Secretary*—George F. Scott, 4 Holdenhurst Road, Bournemouth.

Boys' Own' Postal Photographic Club.—(ESTABLISHED 1889.)—*Secretary and Treasurer*—J. E. Hardwich, 7 Belford Terrace, Sunderland.

Bradford Photographic Society.—(ESTABLISHED 1895.)—Meetings held at Unity Rooms, Sunbridge Road. *President*—Alex. Keighley, F.R.P.S. *Vice-Presidents*—R. J. Appleton, W. Halstead, O. Nicholson, Percy Lund, A. P. Rendell, F. J. R. Sutcliffe. *Committtee*—H. Cousen, W. Drake, Rev. W. H. Eastlake, W. I. Gray, A. Graham, A. Hewitt, C. Mull r, P. E. Newstead, G. Swain, G. R. Thistlethwaite. *Hon. Lanternists*—G. Swain and G. R. Thistlethwaite. *Hon. Treasurer*—F. Nicholson. *Hon. Secretary*—J. Snowden, c/o Messrs. Percy Lund, Humphries, & Co., Ltd., 5 Godwin Street, Bradford.

Brechin Photographic Association.—(ESTABLISHED 1888.)—Meetings held at the Y.M.C.A. Institute. *President*—William Shaw Adamson. *Vice-Presidents*—R. W. Duke and James D. Ross. *Committee*—John Cuthbert, David B. Robertson, James C. Middleton, David Wilson. *Treasurer*—John E. Small. *Secretary*—Alexander Watson, 75 River Street, Brechin.

Brierley Hill and District Camera and Field Club.—(ESTABLISHED 1896.)—Meetings held at the Technical School, Brierley Hill. *President*—John Addison, C.C. *Vice-Presidents*—J. S. Williams, W. Cochrane, H. Parry, H. Price. *Council*—J. E. Breeze, F. Gibbons, A. H. Hill, J. Lewis, W. Northwood, W. Pagett, J. Thomas, W. Whitworth. *Treasurer*—H. Parry. *Secretory*—J. H. Burton, Round Oak Station, Brierley Hill.

Brighouse Photographic Society.—(ESTABLISHED 1894.)—*President*—Dr. George A. Farrer. *Vice-Presidents*—George Hepworth, A. H. Ormerod, E. H. Sugden. *Committee*—H. P. Metcalf, T. H. Wood, S. Ormerod, A. Helliwell, S. Ibbotson, Dr. Edwards, H. Sugden. *Hon. Treasurer*—John Wood. *Hon. Secretaries*—J. H. Georgeson and H. Blackburn.

Brighton and Sussex Natural History and Philosophical Society (Photographic Section).—(ESTABLISHED 1892.)—Meetings are held at the Free Library and Museum, Church Street, Brighton. *President*—J. P. Slingsby Roberts. *Vice-Presidents*—Sir Joseph Ewart, M.D., Rev. H. G. Day, M.A., Arthur Newsholme, M.D., Douglas E. Caush, L.D.S., George De Paris. *Chairman (Photographic Section)*—W. Clarkson Wallis. *Committee*—Walter Harrison, D.M.D., D. E. Caush, L.D.S., W. H. Payne, C. B. Stoner, D.D.S., W. W. Mitchell, E. Elgee. *Hon. Treasurer*—Surgeon-General E. McKellar, M.D., J.P. *Hon. Secretary*—R. Chappell Ryan, 43 Compton Avenue, Brighton.

Brighton Photographic Society.—(ESTABLISHED 1895.)—Meetings held at Queen's Square Congregational Church Schoolroom. *President*—W. J. Mannering. *Vice-Presidents*—Dr. E. E. Manwaring and G. Sturt. *Committee*—D. J. Gadsby and J. Pratt. *Secretary and Treasurer*—Ernest A. Coleman, 12 Bond Street, Brighton.

Bristol and West of England Amateur Photographic Association.—(ESTABLISHED 1866.)—Meetings are held at the Literary and Philosophic Club, 20 Berkeley Square, Bristol. *President*—H. A. Hood Daniel. *Vice-Presidents*—Colonel Playfair and Edward Brightman. *Council*—T. Butler, Sidney J. Hill, T. Letchford, Walter Norgrove, S. W. Pullen, and Officers. *Treasurer*—W. Moline. *Secretaries*—Edward Brightman, Lyndale, Redland Road, and Martyn Lavington, 5 The Avenue, Redland Road, Bristol.

British Association for the Advancement of Science.—(ESTABLISHED 1831.)—*President Elect*—Prof. Ramsey, F.R.S. *President*—Sir John Evans, K.C.B., Treas. R.S. *General Treasurer*—Prof. Arthur W. Rücker, M.A., F.R.S. *General Secretaries*—Captain Sir Douglas Galton, K.C.B., D.C.L., LL.D., F.R.S., F.G.S., 12 Chester Street, London, S.W., and A. G. Vernon Harcourt, M.A., D.C.L., LL.D., F.R.S., F.C.S., Cowley Grange, Oxford. *Assistant General Secretary*—G. Griffith, M.A., College Road, Harrow, Middlesex.

British Postal Camera Club.—(ESTABLISHED 1895.)—With a monthly circulating portfolio of members' prints for criticism. *Hon. Secretary and Treasurer*—Arthur J. Haynes, Wharncliffe Cottage, Over Lane, Belper.

Brixton and Clapham Camera Club.—(ESTABLISHED 1889.)—Meetings are held at Brixton Hall, Acre Lane, London, S.W. *President*—James W. Coade. *Vice-Presidents*—E. Dockree, W. Eraser, A. Horsley Hinton. *Council*—C. F. Archer, J. Gunston, R. G. F. Kidson, J. Price, G. W. Welham, W. H. Whittard. *Secretary*—Frederick W. Levett, 116 Loughborough Park, S.W.

Bromley (Kent) Camera Club.—(ESTABLISHED 1896.)—Meetings held at the School of Science and Art, Bromley (Dark Room at the Library Institute). *President*—S. B. Webber. *Vice-Presidents*—Thomas Davis, J.P., and William Willis. *Committee*—John Scott, B.A., M.B. (Chairman), D. T. Playfair, M.D., M.C., F.L.S., H. C. Bond, M.A., F.C.S., Stanley Hawkings, C.E., R. W. James, M.I.M.E., A.M.I.C.E., Albert S. Hicks, F.C.A., Henry J. Tweedy, B.A. *Secretary and Treasurer*—Edgar T. Godward, The School of Science and Art, Bromley, Kent.

Bromsgrove School Photographic Society.—(ESTABLISHED 1893.)—Meetings held at King Edward's School, Bromsgrove. *President*—P. K. Tollit, M.A. *Treasurer*—T. S. Stokes. *Secretary*—B. V. Bruton, The School, Bromsgrove, Worcestershire.

Burton-on-Trent Natural History and Archæological Society (Photographic Section).—(ESTABLISHED 1889.)—Meetings held at 30 High Street, Burton-on-Trent. *President*—Reginald Churchill. *Secretary*—H. H. Port, 103 Scalpcliffe Road, Burton-on-Trent.

Bury Photographic and Arts Club.—(ESTABLISHED 1882.)—Meetings held at 14 Market Street, Bury. *President*—E. W. Mellor, J.P., F.R.G.S., F.I.Inst. *Vice-Presidents*—E. W. Mellor, W. Booth, R. Grundy, jun., R. Wood, T. M. Barbour. *Council*—T. Jones, C. Whittaker, J. W. Handley, J. Hamer, H. M. Dearden. *Hon. Secretary*—A. E. Ridding, 96 Victoria Terrace, Elton, Bury. *Financial Secretary*—C. Stock.

Camera & Company Postal Photographic Circulating Club.—(ESTABLISHED 1891.)—*Hon. Secretary*—Albert O. Forrest, 14 Market Street, Pontypridd.

Campbell College Camera Club.—(ESTABLISHED 1895.)—Meetings held at the Campbell College, Belfast. *President*—G. H. Evans. All communications should be addressed to the President.

Camera Club.—(ESTABLISHED 1885.)—Meetings are held at 28 Charing Cross Road. *President*—Captain W. de W. Abney, C.B., F.R.S. *Vice-Chairman*—F. Machell Smith. *Committee*—H. E. Armstrong, F.R.S., R. Belfield, the Right Hon. the Earl of Crawford, K.T., F.R.S., W. Clarke, R. W. Craigie, A. Deed, G. Davison, J. J. Stuart-Edwards, E. Ferrero, Rev. N. R. Fitzpatrick, M.A., J. Wallace Godfrey, M.A., W. Asbury Greene, Colonel R. Holbeche, B. Lawrence, LL.D., H. H. P. Powles, the Right Hon. the Earl of Rosse, K.P., F.R.S., J. F. Roberts. *Secretary*—F. Seyton Scott, Camera Club.

Cardiff Photographic Society.—(ESTABLISHED 1886.)—Meetings are held at 7 and 8 Working Street. *President*—Samuel W. Allen, M.I.C.E. *Vice-Presidents*—Jonas Watson, J.P., T. Mansel Franklin, G. H. Bedford E. H. Bruton, Alex. Kellar, C. F. Gooch, J.P., G. H. Wells, jun *Council*—J. Jenkins, F. W. Kendall, A. Harris, W. J. Jenkins, A. McKinnon, D. B. McCallum, Jesse Williams, W. H. Kitchin, W. Booth, W. D. Dighton. *Treasurer*—C. E. Hancock. *Secretary*—T. H. Faulks, 127 Bute Road, Cardiff.

Carlisle and County Amateur Photographic Society.—Meetings held at the Rooms, Victoria Viaduct Hotel. *President*—Warwick Hill. *Vice-Presidents*—R. Maclaren, M.D., J. A. Wheatley, J.P., William Wright. *Committee*—Mrs. Mounsey, Miss Currie, R. M. Hill, J. Beaty, E. G. H. Parker, B. Eggleston. *Hon. Treasurer*—John Robson. *Hon. Secretary*—Samuel W. B. Jack, 7 Petteril Bridge Terrace, Warwick Road, Carlisle.

Cheltenham Amateur Photographic Society.—(ESTABLISHED 1865.)—Meetings held at the College Pharmacy, Bath Road, Cheltenham. *President*—General F. Dawson, C.B. *Vice-President*—W. Beetham. *Secretary*—Philip Thomas, College Pharmacy, Bath Road, Cheltenham.

Chester Society of Natural Science and Literature (Photographic Section).—(ESTABLISHED 1887.)—Meetings held at the Grosvenor Museum, Chester. *President*—Henry Stolterforth, M.A., M.D., J.P. *Committee*—P. T. Allen, E. G. Ballard, A.R.S.M., Lieut.-Colonel Dowdall, F. Evans, F. T. Farrimond, F. Longbottom, J. A. McMichael, B.A., B.Sc., C. W. Townshend, T. Wakefield. *Secretary and Treasurer*—James Hampson Spencer, 36 Bridge Street, Chester.

Chichester Photographic Society.—(ESTABLISHED 1893.)—*Patron*—Sir R. G. Raper, Kt. *President*—G. Woodbridge. *Vice Presidents*—Dr. Andrè, Dr. E. H. Buckell, Colonel Paxton, Dr. Paxton. *Committee*—R W. Dawtrey, S. A. Garland, J. Huskinson, E. Hollebone, F. B. Tompkins, E. Thorpe. *Hon. Treasurer*—T. H. Vindall. *Hon. Secretary*—G. M. Turnbull.

Chorley Photographic and Sketching Club.—(ESTABLISHED 1894.)—Meetings held at West Street, Chorley. *President*—John Stanton. *Vice-Presidents*—J. T. Brierley, H. R. Dorning, S. Morris, N. Alker. *Committee*—T. Howarth, J. R. Waring, J. Rawlinson, W. Swarbrick, T. Alker, John Blackshaw, J. Fletcher, A. Collier. *Treasurer*—R. Gill. *Secretary*—Thomas Brindle, 62 Market Street, Chorley.

City of Dublin Y.M.C.A. Camera Club.—(ESTABLISHED 1891.)—Meetings held at 43 Upper Sackville Street, Dublin. *President*—E. MacDowel Cosgrave, M.D. *Vice-Presidents*—Greenwood Pim, M.A., Victor Smyth, J. C. Ruthven, L. R. Strangways, Fred Eason, G. M. Roche. *Council*—G. A. Parnell, A. E. Campbell, Charles E. Stewart, S. C. West, G. W. Riky, J. Gordon, E. Stevenson, J. A. Ray, R. Poynton. *Ladies' Committee*—Miss Owens, Miss Aston, Miss Carnegie. *Hon. Secretary and Treasurer*—R. J. Wilkin, 43 Upper Sackville Street, Dublin.

Clapham Y. M. C. A. Photographic Club.—(ESTABLISHED 1892.)—Meetings are held at the Bedford Hall, High Street, Clapham, S.W. *President*—T. J. Edwards. *Vice-President*—R. D. Gibbs. *Treasurer and Secretary*—G. I. Ninnes, 57 Montholme Road, New Wandsworth, S. W.

Cleckheaton Mechanics' Institute Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Technical School, Brooke Street. *President*—Dr. Farrow. *Vice-Presidents*—A. Rhodes, H. S. Atkinson, E. W. Taylor. *Committee*—J. Drake, A. Smith, G. Stead, F. Slinger, W. Asquith, E. Ellis, Abe. Smith. *Treasurer*—Frank Hirst. *Secretary*—William Drake, 7 Westgate, Cleckheaton.

Cleveland Camera Club (late Erimus Amateur Photographic Club.)—(ESTABLISHED 1891.)—Meetings held at the Literary and Philosophical Society's Rooms, Corporation Road, Middlesbrough. *President*—S. A. Sadler, J.P. *Vice-Presidents*—Dr. Stainthorpe, Dr. Williams, C. L. Bell, J. J. Burton, G. D. Winter, Angus McPherson. *Joint Secretaries*—Messrs. Pearson and Walker, 98 Victoria Road, Middlesbrough.

Clydesdale Camera Club.—(ESTABLISHED 1889.)—Place of Meeting, Wemyss Bay. *President*—Henry Erskine Gordon. *Secretary and Treasurer*—Hon. A. Caroline Burns, Castle Wemyss, Wemyss Bay, N.B.

Colne Camera Club.—(ESTABLISHED 1893.)—Meetings held at the Cloth Hall, Colne. *President*—Rev. T. Leyland. *Vice-Presidents*—J. Duckworth, Jos. Hey, H. Hewitt. *Treasurer*—Joshua Robinson. *Secretary*—R. T. Lawson, 34 Skipton Road, Colne, Lancashire.

Cornish Camera Club.—(ESTABLISHED 1888.)—Meetings held at 22 Market Place, Penzance (*pro tem.*). *President*—W. E. Baily, F.L.S., C.C. *Vice-President*—B. Vivian, M.R.C.S. *Committee*—J. Branwell, jun., Barnes Richards, R. Pearae Couch, A. R. F. Evershed, M.R.C.S. *Treasurer*—A. R. F. Evershed, M.R.C.S. *Secretary*—H. Tonkin, 22 Market Place, Penzance.

Coventry and Midland Photographic Society.—(ESTABLISHED 1883.)—Meetings held at the Technical Institute. *President*—Alderman Andrews, F.G.S. *Vice-Presidents*—Henry Sturmey, A. Seymour, H. D. Waters, E. J. Walker. *Committee*—W. R. Goate, A. B. Clarke, A. L. Bill, F. E. Peirson. *Secretaries*—F. Leigh Martineau and E. M. Iliffe, 19 Hertford Street, Coventry.

Crewe Amateur Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Studio, Chester Bridge. *President*—Rev. W. G. Rainsford, D.D. *Vice-President*—E. Booth. *Committee*—J. Lewis, G. Holden, E. Crooke. *Treasurer*—John Cherrey. *Secretary*—Thomas Gorrell, 106 Edleston Road.

Cromwell Photographic Section of the Great Yarmouth Wheelers.—(Reorganized 1897 from the Cromwell Photographic Club.)—Meetings are held at the Cromwell Hotel, Great Yarmouth. *President*—H. G. Buxton. *Committee*—Charles Rumbold, George Rumbold, T. Goate, P. Causton, W. J. Denew, H. Palmer. *Secretary*—Frank H. Sayers, St. George's Studio, Great Yarmouth.

Croydon Camera Club.—(Established 1890.)—Meetings held at 106 George Street, Croydon. *President*—Hector Maclean, F.G.S., F.R.P.S. *Vice-Presidents*—The Mayor of Croydon (Councillor Martin Luther Moss), the Right Hon. C. T. Ritchie, M.P., Sir Frederick Edridge, J.P., James Glaisher, F.R.S. *Council*—W. Burn, A. W. Hirst, A. E. Isaac, G. W. Jenkins, A. Jenkins, G. Linton, J. Noaks, J. Packham, F.R.P.S., W. H. Rogers, J. Smith, G. W. Watson, S. H. Wratten. *Treasurer*—H. E. Holland. *Hon. Secretary*—Lionel G. Kough, 122 Birchanger Road, South Norwood, S.E.

Croydon Microscopical and Natural History Club (Photographic Section).—(Established 1870.)—Meetings held at the Public Hall, George Street, Croydon. *President*—J. M. Hobson, M.D., B.Sc., &c. *Vice-Presidents*—John Berney, F.R.M.S., P. Crowley, F.Z.S., F.L.S., H. S. Eaton, M.A., H. T. Mennell, F.L.S., H. G. Thompson, M.D., J.P., &c., Edward Lovett, H. F. Parsons, M.D., F.G.S., W. Murton Holmes. *Committee*—J. H. Baldock, F.C.S. (Lanternist and Recorder), Charles Moss, E. J. Platts, Alfred Roods (Librarian), C. H. Burnaby Sparrow. *Treasurer*—E. B. Sturge. *Secretary*—Harry Douglass Gower, 55 Benson Road, Waddon, Croydon, Surrey.

Cyclists' Photographic Portfolio Club.—(Established 1886.)—Private circulating Club for inspection and criticism of members' prints. *Hon. Secretary*—A. B. Clarke, Hampton House, Coventry.

Darwen Photographic Association.—(Established 1894.)—Meetings held at the Belgrave Schools, Bolton Road entrance. *President*—George Butterworth. *Vice-Presidents*—Rev. Henry Irving and James E. Cooper. *Committee*—R. Ibbotson, J. Cook, R. Holden, A. Almond, J. Cavis, W. Knowles, J. F. Leach, John Cooper. *Treasurer*—Joseph Thomas. *Secretary*—R. H. Duckworth, 445 Bolton Road, Darwen.

Derby Photographic Society.—(Established 1884.)—Meetings held at the Y.M.C.A. Institute on the third Tuesday in the month. *President*—Capt. W. de W. Abney, C.B., D.C.L., F.R.S., F.R.A.S. *Vice-President*—T. A. Scotton. *Committee*—E. W. Bayley, A. H. Bennett, W. R. Bland, C. Bourdin, Dr. William Brass, J. Fleet, A. V. Haslam, C. B. Keene, G. Walker. *Hon. Treasurer*—F. H. Gandy. *Hon. Secretary*—E. Fearn, Richmond Road, Derby.

Devon and Cornwall Camera Club (being the Photographic Section of the Plymouth Institution).—(Established 1887.)—Meetings held at the Athenæum, Plymouth. *Acting Secretary of Section*—R. Hansford Worth, 42 George Street, Plymouth.

Devonport Camera Club.—(ESTABLISHED 1891.)—Meetings are held at the Oddfellows' Hall, Ker Street, Devonport. *President*—R. E. J. Lamb. *Vice-Presidents*—J. F. Coombes, C. Dart, C. H. Dymond, E. G. Turney. *Committee*—J. Crook, F. E. Turney, C. H. Moore, W. E. A. Drinkwater. *Treasurer*—C. Croydon. *Secretary*—W. H. Lamb, 7 Chapel Street, Devonport.

Doncaster Scientific Society.—(ESTABLISHED 1880.)—*Past Presidents*—The Rev. Canon Brock, M.A., The Rev. W. R. Weston, J. Mitchell Wilson, M.D., F.C.S., The Rev. G. Smith, M.A., John Maw Kirk, F.R.M.S., Walter Roberts, J. Greenhalgh Walker, T. Lovel Atkinson, M.A., LL.B., H. H. Corbett, M.R.C.S., J. B. Prosser, H. Culpin, M. H. Stiles. *President*—G. Bisat. *Vice-Presidents*—W. E. Atkinson, J. Mitchell Wilson, M.D., F.C.S., H. Culpin, M. H. Stiles. *Committee*—T. Cuttriss. R. A. Bellamy, Mrs. Corbett, Mrs. Robinson, T. W. Plant, H. Ord, *Hon. Secretary and Treasurer*—H. H. Corbett, 19 Hallgate, Doncaster.

Dorset Amateur Photographic Association.—(ESTABLISHED 1886.)—Place of Meeting, Dorchester. *President*—Rev. W. Miles Barnes, M.A. *Committee*—Miss E. Williams and R. W. Copeman. *Secretary and Treasurer*—Rev. T. Perkins, M.A., F.R.A.S., Turnworth Rectory, Blandford.

Dukinfield Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Co-operative Hall, Dukinfield. *President*—T. Hodgetts Gordon, B.A., C.C. *Vice-Presidents*—S. T. Ainsworth, J. W. Hadfield, John T. Lees. *Council*—J. W. Andrew, R. Deakin, W. Jenkinson, P. Rigby, S. Woolley. *Librarian*—H. Broadbent. *Treasurer*—John Winterbottom. *Secretary*—W. H. Shirley, Woodbine Terrace, Dukinfield.

Dulwich Photographic Society—(ESTABLISHED 1895.)—Meetings held at Malmesbury College, East Dulwich Road, S.E., on the second and fourth Tuesdays, at 8.30 p.m. *President*—Sir John Blundell Maple, Bart, M.P., L.C.C. *Vice-President*—J. A. Causton. *Chairman*—H. C. Jackson. *Committee*—E. W. Beer, T. Mitchell, H. Bemister, F. Thomas. F. F. Thomas, — Oakenfall. *Hon. Lanternists*—C. H. Batty and H. Mawbey. *Excursion Secretary*—F. Thomas. *Hon. Treasurer*—C. Dunlop. *Curator and Hon. Secretary*—F. J. W. Pope, 3 Burnaston Terrace, Grove Vale, East Dulwich, S.E.

'Dundee Advertiser' Photographic Club.—(ESTABLISHED 1894.)—Meetings held at Mather's Hotel, Whitehall Street, Dundee. *Hon. President*—Sir John Leng, M.P. *President*—A. C. Mackenzie. *Vice-President*—Alex. F. Gow. *Committee*—John Macrae, Robert Paterson, James L. Scott. *Secretary and Treasurer*—Archibald Campbell, 48 Cleghorn Street, Dundee.

Dundee and East of Scotland Photographic Association.—(ESTABLISHED 1879.)—Meetings held at Lamb's Hotel, Dundee. Club Rooms, 39 High Street, Dundee. *President*—Professor Steggall. *Vice-Presidents*—G. G. Maclaren and W. F. Hill. *Committee*—T. Berry, W. Salmond, A. Stewart, W. H. Tittensor, P. Kilgour, D. Ireland, Dr. Tulloch, A. Wilson, A. Campbell, Baxter Gray, J. A. Mackenzie, T. Maxwell, *Secretary and Treasurer*—V. C. Baird Broughty Ferry, N.B.

Dunstable Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Dunstable Institute. *President*—Dr. Hughes. *Vice-Presidents*—Albert Gutteridge and Walter Love. *Treasurer*—A. Perkins. *Secretary*—Edward Hare, The Poplars, Dunstable.

Durham City Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Shakespeare Hall, North Road, Durham. *President*—Captain E. White. *Vice-Presidents*—E. Meynell and J. F. Hobson. *Council*—J. Booth, F. Cluff, T. Harker, J. Morson. *Treasurer*—Councillor W. Gray. *Secretary*—Robert Hauxwell, The Avenue, Durham.

Ealing Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Public Buildings, Ealing. *President*—H. W. Peal. *Vice-Presidents*—C. Jones, W. T. White, T. Simpson. *Committee*—Dr. Clifford Gibbons, W. G. Gregory, A. F. Taylor, B. E. Peal, Roland Whiting, A. Richardson, A. Ernest Smith, H. A. Ball, W. G. Wagner. *Treasurer*—A. F. Taylor. *Secretary*—R. Yoakley Murphy, 7 Argyle Road, Castle Hill, Ealing.

Eastbourne Photographic Society.—(ESTABLISHED 1892.)—Meetings held at the Natural History Society's Room, Lismore Road. *President*—Henry Habgood, M.D. *Vice-Presidents*—H. Michel Whitley and Rev. H. G. Jameson. *Committee*—Messrs. Coster, Ellmore, Kelsey, Plomer, Sparks, Molineux, and Sparrow. *Secretary and Treasurer*—John J. Hollway, 11 Hyde Gardens, Eastbourne.

East Worcestershire Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Institute, Bromsgrove. *President*—C. R. Sayer. *Vice-Presidents*—G. E. Abell, J.P., Jno. Badger, Dr. Ball, E. J. Bigwood, Austen Chamberlain, M.P., W. Corbett, R. Smallwood, J.P., Dr. Wood. *Council*—Miss Brooke, C. G. Crooke, Miss Sayer, F. E. Slatsr, J. H. Sutton, W. H. Wilson. *Hon. Auditor*—T. Roper. *Hon. Treasurer*—G. W. Widdowson. *Hon. Secretary*—O. Giles, The Crescent, Bromsgrove.

Edinburgh Camera Club.—(ESTABLISHED 1890.)—*President*—P. J. Stirling Boyd. *Committee*—Miss Clouston, William Ford, and the President and Secretary. *Hon. Secretary and Treasurer*—Henry Tod, W.S., 45 Castle Street, Edinburgh.

Edinburgh Photographic Club.—(ESTABLISHED 1881.)—Meetings are held at 38 Castle Street. *President*—Frank P. Moffat. *Committee*—President, Treasurer, and Secretary. *Treasurer*—George Cleland. *Secretary*—Thomas Barclay, 180 Dalkeith Road, Edinburgh.

Edinburgh Photographic Society.—(ESTABLISHED 1861.)—Meetings held at 38 Castle Street, Edinburgh. *Patron*—H.R.H. the Reigning Duke of Saxe-Coburg and Gotha, K.G., K.T., K.P., &c. (Duke of Edinburgh). *Hon. Presidents*—Hippolyte J. Blanc, R.S.A., and John C. Oliphant, M.A. *President*—James Patrick. *Vice-Presidents*—Alexander Eddington and John Stuart Smith. *Council*—Charles J. Souter, P. M. Macintyre, William Linton, J. B. Johnston, Robert Ayton, H. Scott Lauder, James Hay, James Ritchie, F. P. Moffat, Alexander Allan, A. H. Baird, F.R.P.S., John Warrack, jun. *Librarian*—John Anderson. *Treasurer*—George Cleland. *Secretary*—J. S. McCulloch, W.S., 2 George Street, Edinburgh.

'Evening Times' Camera Club.—(ESTABLISHED 1895.)—Meetings held at 46 Gordon Street, Glasgow. *President*—J. H. A. McIntyre, M.I.M.E. *Vice-Presidents*—T. S. Muir, D. R. Macdonald, A. H. Duncan, J. M. Ewing. *Committee*—K. McLean, W. M. Muirhead, H. C. Shelley, P. R. Wiesner, W. E. Mackie, Thomas Davidson, T. R. Murray, D. W. Macdonald, J. Christie, Robert Burnie, James Gray, G. O. Broadbent, W. L. Primrose, Samuel Smith. *Treasurer*—William M. Gossip. *Secretary*—Robert Sproul, 869 New City Road, Glasgow.

Everton Camera Club.—(ESTABLISHED 1896.)—Meetings are held at Village Street, Everton, Liverpool. *President*—Harry Handley. *Vice-Presidents*—Edwin Allmey and James Hawkins. *Committee*—W. H. Griffiths, E. N. Ellis, T. Sanderson, J. F. Finegan, C. B. Stonehouse. *Secretary and Treasurer*—William Tansley, 14 Wentworth Street, Everton, Liverpool.

Exeter Camera Club (Affiliated to the Exeter Literary Society).—(ESTABLISHED 1890 UNDER STYLE OF EXETER AMATEUR PHOTOGRAPHIC SOCIETY.)—Meetings are held at Barnfield House, Exeter. *President*—Charles Cole. *Vice-Presidents*—W. Brock, J.P., J. W. Huggins, W. Lloyd Jones. *Council*—President, Vice-Presidents, Hon. Treasurer, Hon. Secretary, and H. J. Stanbury, H. C. Bamfylde, R. C. Cole, W. North, E. W. Cox, E. Pocknell (Librarian), F. Green (Lanternist). *Treasurer*—J. Hinton Lake. *Secretary*—Cecil R. M. Clapp, Barfield House, Exeter.

Fakenham District Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Lancaster Temperance Hotel, Fakenham. *President*—Rev. William Martin, B.A. *Vice-Presidents*—Rev. A. E. Humphreys, M.A., and Algernon Digby, M.A. *Committee*—G. H. Davis, H. R. C. Davis, R. W. Dewing, W. O. Miller, J. J. Roberts. *Secretary and Treasurer*—Henry Newson, The Square, Fakenham, Norfolk.

Falkirk Amateur Photographic Association.—(ESTABLISHED 1889.)—Meetings held at Newmarket Street. *President*—George Sherriff. *Vice-President*—T. T. Blackadder. *Committee*—Messrs. Johnstone, Hume, Lyon, J. S. Higgins, Chalmers, and Boyd. *Treasurer and Assistant Secretary*—William C. Murray. *Secretary*—John Higgins, High Street, Falkirk.

Faversham Institute Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Faversham Institute. *President*—Earl Sondes. *Vice-Presidents*—Captain C. F. Hooper, W. C. Stunt, C. T. Evers, M.D. *Committee*—A. N. Filmer, F. C. Jackman, C. Cremer, R. S. Dunn, E. Holladay, M. Laxon. *Secretary and Treasurer*—Charles H. Semark, 8 Albion Terrace, Faversham.

Gainsborough and District Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Coffee Tavern, Gainsborough. *President*—F. J. Cribb. *Vice-Presidents*—E. G. Pepper and C. L. Wilkinson. *Committee*—Messrs. Brocksom, Johnson, Fullalove, Todd. *Secretary*—R. C. Puckering, Clinton House, Gainsborough.

Glasgow and West of Scotland Amateur Photographic Association.—(ESTABLISHED 1882.)—Meetings held at 180 West Regent Street, Glasgow. *President*—Thomas Steventon. *Vice-President*—A. Cameron Todd. *Council*—Archibald Watson, J. S. Gardner, J. C. Oliver, Dr. Williams, George Chalmers. G. S. Bryson. *Hon. Librarian*—N. G. Reid. *Hon. Lanternist*—Andrew Brown. *Hon. Treasurer*—William J. B. Halley. *Hon. Secretary*—William Goodwin, 3 Lynedoch Street.

Glasgow Photographic Association.—(ESTABLISHED 1862.)—*President*—A. Lindsay Miller. *Vice-Presidents*—William Lang, F.C.S., and J. Craig Annan. *Council*—Robert Dodd, J. E. Hanbidge, George Mason, J. C. Oliver, John Stuart, Archd. Watson. *Treasurer*—George Bell. *Secretary*—Frederick Mackenzie, 122 Wellington Street.

Glenalmond Photographic Club.—(ESTABLISHED 1890.)—*President*—Arthur S. Reid, M.A., F.G.S. *Vice-President*—E. S. Lyttel, B.A. *Committee*—The Officers. *Hon. Librarian*—S. S. Clarke. *Hon. Treasurer*—T. N. J. Bell. *Hon. Secretary*—G. O. Cunningham, Glenalmond Photographic Club, Glenalmond, Perthshire.

Glossop Dale Photographic Society.—(RE-ESTABLISHED 1883.)—Meetings held at Norfolk Square, Glossop. *President*—E. Partington, J.P. *Vice-Presidents*—Colonel Sidebottom, M.P., and S. H. Wood. *Committee*—J. Merry, H. Broadhurst, J. T. Whitham, J. T. Hyde, W. Swire. *Treasurer*—J. Hardman. *Secretary*—T. W. Sharpe, 1 Pike's Lane, Glossop.

Gloucestershire Photographic Society.—(RECONSTRUCTED 1887.)—*President*—Richard W. Dugdale. *Vice-President*—Dr. Oscar W. Clarke. *Committee*—H. S. Crump, Dr. W. Hodges, W. Walwin, A. H. Pitcher. *Treasurer*—J. Tibbitts. *Secretary*—Edward A. Ind, 36 Northgate, Gloucester.

Goldsmiths' Institute Camera Club.—(ESTABLISHED 1893.)—Meetings held at the Goldsmiths' Institute, New Cross. *President*—J. W. Penfold. *Vice-Presidents*—J. S Redmayne, Arthur H. Wood, Arthur G. Bloxam, A. L. Spiller, Miss B. Griffiths. *Hon. Treasurer*—J. H. Ridge. *Hon. Secretary*—H. W. J. Browse. *Assistant Hon. Secretary*—C. B. Story, The Goldsmiths' Institute, New Cross.

Goole Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Exchange, Goole. *President*—Robert Blair, J.P., M.D. *Vice-President*—T. C. Turton. *Committee*—Messrs. Turton, Medgley, Buck, Timms, Simpson, and Kettle. *Secretary*—S. Wells, Airmyn, Goole.

Gospel Oak Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Congregational Schools, Lismore Road, Gospel Oak, N.W. *President*—Rev. H. Le Pla. *Vice-President*—F. H. Hall. *Committee*—W. Beyer, J. Gittens, J. Hingston, J. Pridham, C. Stone. *Treasurer*—J. E. Rayner. *Secretary*—William Alfred Palmer, 13 Dale Road, Kentish Town, N.W. *Assistant Secretary*—H. Billingsley.

Graphic Society.—(ESTABLISHED 1885.)—Meetings held at Plymouth. *President*—S. Kerswell. *Council*—Miss Coath, Messrs. Roy and Foster, Miss Picken, with Officers. *Treasurer*—G. F. Watson. *Secretary*—J. S. Hawker, Mutley House, Plymouth.

Gravesend Photographic Society.—Meetings held at the Medical Hall Rooms, Milton Road, Gravesend. *President*—J. C. Johnson. *Vice-President*—E. J. Wall. *Council*—Percy J. Boorman, Horatio Sandford, B. L. Rankin, F. H. Wells, Thomas Nettleingham, S. R. Macartney, G. W. Cobham. *Secretary and Treasurer*—T. L. Winnett, 5 The Grove, Gravesend.

Great Yarmouth Amateur Photographic Association.—(Established 1893.)—Meetings are held fortnightly on Monday evenings at the Bridge Hotel, Southtown, Great Yarmouth. *Secretary and Treasurer*—George T. Davis, 4 Market Place, Great Yarmouth.

Great Yarmouth Camera Club.—(Established 1891.)—Meetings are held at the Presidents' and Members' Houses. *President*—Dr. Aacock, *Vice-President*—Rev. E. Rainbow. *Committee*—A. Price, Percy Wiltshire, H. D. Arnott, Rev. D. H. Battersby, E. Swann. *Treasurer*—J. Taylor. *Secretary*—H. Harvey George, The Tower, Gorleston, Great Yarmouth.

Greenock Camera Club.—(Established 1888.)—Meetings are held at the Museum Committee Room, Kelly Street, Greenock. *President*—William Blair. *Vice-President*—James Graham. *Committee*—President, Vice-President, Lanternist, Treasurer, Secretary, and W. D. Boyd, Hugh Watson, T. A Cunningham, H. Robertson. *Lanternist*—R. W. Jamieson. *Treasurer*—Alexander Bathgate. *Secretary*—George Dunlop, 2 Church Place, Greenock.

Grimsby and District Photographic Society.—(Established 1893.)—Meetings are held at 27a Victoria Street, Grimsby. *President*—Jack Sutcliffe, J.P. (Mayor). *Vice-Presidents*—R. C. Long and Dr. Simpson. *Committee*—W. J. Brumpton, W. H. Marris, E. Shankester, A. E. Mathews, W. C. Butler, — Fountain, — Helsby, A. H. Hewitt, W. Merritt, J. H. Clayton. *Secretary*—A. H. Hewitt, 10 Riby Square, Grimsby.

Guildford Photographic Society.—(Established 1890.)—Meetings held at 36 High Street, Guildford. *President*—The Right Hon. the Earl of Onslow, G.C.M.G. *Vice-Presidents*—Sir J. F. Leese, G. J. Jacobs, J. Russell, A. Horsley Hinton, G. C. Williamson. *Council*—A. W. Bullen, A. J. Moon, T. L. Inman, Rev. G. E. J. Milner. *Treasurer*—J. H. Nunn. *Secretary*—Alfred E. Moon, 36 High Street, Guildford.

Hackney Photographic Society.—(Established 1889.)—Meetings held at the Pembury Hotel, Amhurst Road, Hackney. *President*—Major C. Woolmer-Williams. *Committee*—A. Barker, C. T. Fleetwood, F. W. Gosling, E. Puttock, W. Rawlings, J. J. Westcott, L S. Wilks. *Treasurer*—Walter L. Barker. *Secretary*—W. F. Fenton-Jones, 12 King Edward Road, Hackney, N.E.

Halifax Camera Club.—(Reorganized 1895.)—Meetings held at 29 Northgate, Halifax. *President*—J. Ingham Learoyd. *Vice-Presidents*—T. Illingworth, H. Mortimer, C. Thomas, A. Priestley, J. W. Pilling, G. H. Hodgson. *Council*—Henry Hollas, E. Laughton, T. Palmer, A. Rothera, E. Knapton, George Dyson, A. Oldfield. *Hon. Lanternist*—A. Oldfield. *Treasurer*—Haley Hollas. *Secretary*—J. W. Holland, 17 Glen Terrace Clover Hill, Halifax.

Halifax Photographic Club.—(Established 1881.)—Meets the last Thursday in each month in the Mechanics' Hall at half-past seven, p.m. *President*—B. Rowley. *Vice-Presidents*—T. Illingsworth and E. J. Smith. *Council*—B. B. Bingley, Major Holroyde, H. Mossman, Councillor S. Smith, Joseph Whiteley, together with the Officers. *Auditor*—S. Goodman. *Treasurer*—E. H. Child. *Hon. Secretary*—W. Clement Williams, 13 Aked's Road, Halifax.

Haltwhistle and District Photographic Association.—(Established 1889.)—Meetings are held at the Association's Rooms, Haltwhistle, Carlisle. *President*—Dr. W. R. Speirs. *Vice-President*—Major Anne. *Hon. Secretary and Treasurer*—David Macadam, London and Midland Bank, Limited, Haltwhistle.

Hamilton Photographic Association.—(Established 1894.)—Meetings held at the Club Room, Castle Street, Hamilton. *President*—William Barrie. *Vice-President*—John Dick, M.A. *Council*—David N. Cross, James D. Rankin, Peter Tanish, J. C. Pollock, David Miller, David Mimms, Charles Hotson. *Treasurer*—R. A. Wright. *Secretary*—George Brown, Commercial Buildings, Hamilton.

Handsworth Photographic Society.—(Established 1894.)—Meetings held at College House, Hamstead Road, Handsworth, Birmingham. *President*—Philip Whitehouse. *Vice-Presidents*—W. J. Foster, L.R.C.P., E. F. Freeland, C. F. Jarvis, E. J. Timings. *Council*—G. Allen, J. H. Brindley, W. Duff, H. C. Manton, W. J. Morgan, G. Owen, G. Thompson, jun., A. E. Teague. *Treasurer*—C. L. Stait. *Secretary*—G. D. K. Boyle, The Glen, Albion Road, Handsworth, Birmingham.

Hastings and St. Leonards Photographic Society.—(Established 1888.)—*Past Presidents*—Wilson Noble and Rev. A. B. Cotton. *President*—G. G. Gray, J.P., LL.D., F.R.G.S., F.R.H.S., F.L.S., F.S.A., &c. *Vice-Presidents*—Lord Brassey, K.C.B., J. H. Blomfield, Rev. A. B. Cotton, Dr. S. Gilder, Dr. Locke, Rev. A. M. Macdona, J. H. Mayor, Wilson Noble, Dr. A. C. Routh, Lucas Shadwell, M.P., W. Shuter, W. Stubbs, J.P., Councillor F. Tuppenney, Macer Wright. *Council*—J. Barclay, J. H. Godbold, J. F. Mastin, G. Merryweather, J. Smith. *Hon. Treasurer*—W. M. Simpson. *Hon. Secretary*—A. Brooker, 21a Wellington Place, Hastings.

Helios Postal Photographic Club.—(Established 1887.)—A Postal Photographic Club, circulating portfolios amongst the members for the insertion of photographs, which are mutually criticised upon forms supplied for the purpose. *Secretary and Treasurer*—Henry Everett, 125 St. Paul's Road, Bow, London, E.

Holborn Camera Club.—(Establisaed 1889)—Meetings held at 138 Salisbury Court, Fleet Street, E.C. *President*—D. R. Lowe. *Vice-Presidents*—F. Brocas, S. T. Chang, F. Knights. *Committee*—H. Cobb, A. Hodges, E. Hodges, F. J. Cobb. *Librarian and Assistant Secretary*—H. G. Trayfoot. *Treasurer*—Albert Bell. *Secretary*—John Brittain, jun., 52 Hilldrop Road, Camden Road, N.

Herefordshire Photographic Society.—(ESTABLISHED 1885.)—Meetings held at Clarence House, West Street, Hereford. *President*—Alderman T. Blake, J.P. *Vice-Presidents*—A. Watkins and J. Parker. *Council*—A. C. Edwards, W. Groom, A. C. Slatter, E. G. Davis. *Treasurer*—W. E. Haines. *Secretary*—Cecil Gethen, 9 St. Nicholas Street, Hereford.

Hove Camera Club.—(ESTABLISHED 1892.)—Meetings are held at the Hove Town Hall. *President*—G. B. Woodruff, J.P. *Vice-Presidents*—H. H. Taylor, F.R.C.S., and C. Job. *Committee*—C. B. Stoner, R. Chrimes, W. P. Haycraft. *Treasurer*—J. Williamson. *Secretary*—E. E. Mainwaring, M.R.C.S., &c., 73 Lansdowne Place, Brighton.

Huddersfield Naturalist and Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the Y.M.C.A. Large Lecture Room. *President*—H. G. Brierley. *Vice-President*—T. W. Woodhead. *Committee*—T. H. Bartlam, J. B. Littlewood, F. Netherwood, W. A. Beevers, A. Houghton, Thomas Kendal, A. W. Sykes, T. Jenkinson. *Treasurer*—A. W. Whiteley. *Secretary*—A. Clarke, 9 St. Andrew's Road, Huddersfield.

Hull Photographic Society.—(ESTABLISHED 1884.)—Meetings are held at 71 Prospect Street, Hull. *President*—A. H. White. *Vice-Presidents*—J. Pybus and J. Hollingworth. *Hon. Lanternists*—A. H. Spavin and E. A. Hellier. *Hon. Librarian*—B. H. Brewer. *Treasurer*—W. M. Lyth. *Joint Hon. Secretaries*—J. V. Saunders, 151 Park Avenue, Hull, and R. Ethelbert Johnson, 6 Balmoral Terrace, Anlaby Road, Hull.

Ipswich Scientific Society (Photographic Section).—(ESTABLISHED 1869.)—Meetings are held at the Ipswich Museum. *President*—G. Vincent, M.D., M.R.C.S. *Committee*—J. S. Corder, W. J. Eccott, S. A. Notcutt, E. P. Ridley, W. Vick, F. Woolnough. *Treasurer*—Henry Miller. *Secretary*—Frank Woolnough, Museum, Ipswich.

Isle of Thanet Photographic Society.—(ESTABLISHED 1888.)—Affiliated to the Royal Photographic Society. Meetings held at the Church Club, Broad Street, Ramsgate. *President*—Rev. H. Bartram, M.A. *Vice-Presidents*—Rev. C. E. Eastgate, M.A., G. Dowker, F.G.S., W. Saunders, L.D.S., R.C.S.I., J. H. Forwalk, F.R.H.S. *Committee*—G. F. Blower, E. Deacon, W. F. Roberts, A. D. Sackett, A. R. Skellet, A. L. Spratling. *Hon. Lanternist*—J. H. Forwalk. *Hon. Secretary and Treasurer*—J. C. Goldsack, Fletland House, The Elms, Ramsgate.

Keighley and District Photographic Association.—(ESTABLISHED 1889.)—Meetings held at the Mechanics' Institute, North Street, Keighley. *President*—Alexander Keighley, F.R.P.S. *Vice-Presidents*—J. G. Dickinson, Walter Tate, Samuel Bairstow. *Committee*—J. H. Bentley, Thomas Heaps, Ellis Myers, J. Y. Slater, Thomas A. Smith, C. H. Smith, M. Houghton, E. Cockshott. *Treasurer*—Walter Mitchell. *Secretary*—John Gill, 27 Highfield Lane, Keighley. *Assistant Secretary*—W. H. Hainsworth.

Kendal Literary and Scientific Institution (Photographic Section).—(ESTABLISHED 1886.)—Meetings held at the Museum. *Chairman*—Gilbert Gilkes. *Committee*—J. Severs, T. Sharp, J. Sawyers, E. Boundy, C. E. Greenhall, and Chairman, Treasurer, and Secretary. *Treasurer*—T. N. Ritson. *Secretary*—George R. Hargreaves, jun., 17 Greenside, Kendal.

Kilmarnock and Ayrshire Photographic Society.—(ESTABLISHED 1887.)—Headquarters, Elm Bank, Kilmarnock. *President*—Robert Boyd. *Vice-President*—J. J. Railton. *Treasurer*—John Henderson. *Secretary*—T. Milloy, 41 Boyd Street, Kilmarnock.

King's Lynn Photographic Society.—(ESTABLISHED 1894.)—Meetings held at St. James's Rooms. *Council*—Messrs. Cockle, Daw, Taylor, Tilson, and Winch. *Treasurer*—H. Tilson. *Secretary*—W. E. Daw, Church Street, King's Lynn.

King's Lynn Y.M.C.A. Photographic Club.—(ESTABLISHED 1896.)—Meetings are held at the Y.M.C.A. Rooms, St. James's Street. *Committee*—J. O. Reynolds (Chairman), G. M. Bridges, Mrs. Andrews, S. Smyth, Mrs. Ramsell, B. Johnsen. *Treasurer*—E. H. Andrews. *Hon. Secretaries*—William Lock, 118 Norfolk Street, and F. Hampton, Millfleet Terrace.

Kingston-on-Thames and District Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Sun Hotel, Kingston. Club Rooms, 9 Fife Road, Kingston. *President*—Rev. G. J. Swinnerton. *Vice-Presidents*—Rev. F. C. Lambert, W. Montagu Robertson, Dr. Finny. *Committee*—T. Wilson, A. Vandendreische, W. E. Price, A. Hill, Dr. Luscombe, A. E. Smith. *Treasurer*—W. Montagu Robertson. *Secretaries*—John F. East, Uxbridge House, Surbiton, and Paul A. C. Armfelt, Melbourne Lodge, East Molesey.

Lake District Camera Club.—(ESTABLISHED 1894.)—Meetings held at the Lake District Camera Club, Windermere. *President*—J. Bridson, J.P. *Vice-Presidents*—A. Dunlop, J.P., Paul Lange, George Rutter. *Treasurer*—Lieut.-Colonel Reade. *Secretary*—Frederick B. Cattley, Hazelwood, Windermere.

Lancaster Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Society's Rooms, Stonewell, Lancaster. *President*—Alan Garnett. *Vice-Presidents*—J. W. Pickard and R. W. Wearing. *Committee*—N. Holden, A. S. Barling, J. Crane, J. Parkinson, J. B. Briggs (Librarian). *Treasurer*—W. H. Sutterthwaite. *Secretary*—W. Briggs, 21 Cheapside, Lancaster.

Lantern Slide Exchange Club.—(ESTABLISHED 1889.)—This Club was formed to circulate and exchange lantern slides among its members. *Secretary*—J. S. Hawker, Mutley House, Plymouth.

Leamington Amateur Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Pump Rooms, Leamington. *President*—Rev. Ed. Healy. *Treasurer*—B. Magrath. *Secretary*—Signor Aspa, Priory House, Leamington.

Leeds Camera Club.—(ESTABLISHED 1893.)—Meetings held at the Grand Restaurant, Boar Lane, Leeds. *President*—R. Bourke. *Vice-Presidents*—Major Norwood, Rev. J. Beanland, M.A., S. Barnes, A. Hornburg, Dr. J. T. Thresh. *Committee*—W. Emmott, F. Rust, P. Elliff, H. Morfitt, C. C. Vevers, G. Dixon, W. Fox. *Treasurer*—T. R. Thompson. *Secretaries*—W. R. Irwin, 3 Harold Terrace, Hyde Park, Leeds, and N. Stockwell, 60 Woodsley Road, Leeds.

Leeds Photographic Society.—(Established 1852.)—Meetings held at the Leeds Institute of Science, Art, and Literature. *President*—Peter Gilston, J.P. *Vice-Presidents*—Herbert Denison, F.R.P.S., and B. A. Burrell, F.I.C. *Committee*—A. W. Atkinson, H. P. Atkinson, Rev. J. Beanland, M.A., Godfrey Bingley, F. Butterworth, G. H. Rodwell, James Taylor, S. A. Warburton, together with the Officers. *Hon. Secretary and Treasurer*—Alfred Naylor, 2 Providence Terrace, Leeds.

Leicester and Leicestershire Photographic Society.—(Established 1885.)—Meetings held at the Old Town Hall. *President*—T. W. Gamble. *Vice-President*—W. J. Coates. *Committee*—G. Bankart, W. Howard, E. B. Miles, W. Murry, J. Porritt, S. Squire. *Treasurer*—J. Toone. *Secretary*—T. Brown, 68 Church Gate, Leicester.

Leigh Photographic Society.—(Established 1892.)—Meetings are held in the Old Grammar School, Market Place, Leigh. *President*—M. F. Burrows, J.P. *Vice-Presidents*—Dr. Jos. Jones, Robert Lee, T. Lee Syms, J. Ward, B.A., J. H. Stephens, R. B. Mawson, W. Hampson, T. Peters. *Committee*—J. Berry, T. G. Hirst, W. Crouchley, T. Mercer, P. Seddon. *Treasurer*—Thomas Haddock. *Secretary*—William Rose Moore, 92 Bradshawgate, Leigh.

Leith Amateur Photographic Association.—(Established 1888.)—Meetings held at the Liberal Club. *President*—Robert Hunter. *Vice-President*—Thomas Wilson. *Council*—W. M. Smith, A. D. Guthrie, W. Seater. *Treasurer*—M. Campbell. *Secretary*—Alexander Pitkethly, 8 Wilkie Place, Leith.

Lewes Photographic Society.—(Established 1888.)—Meetings are held at the Town Hall, Lewes. *President*—G. J. Whitman. *Vice-President*—J. Tunks. *Committee*—E. T. Hall, W. E. Nicholson, E. L. Tippin, W. J. Young, C. A. Wells. *Secretary and Treasurer*—George Carpenter, 81 High Street, Lewes.

Lewisham Camera Club.—(Established 1890.)—Meetings held at the Rooms of the Congregational Church, Lewisham High Road, New Cross, London, S.E. *President*—B. Davidson. *Vice-Presidents*—Mr. Justice Darling, W. J. Dibdin, F.I.C., F.C.S., A. Haddon, Prof. C. J. Lambert, M.A., F.R.A.S., H. Bedford Lemere, A. H. Miles, M. Stodart. *Committee*—H. Allen, F. R. Ball, C. Churchill, A. Roberts, A. J. Dickinson, F.I.C., F.C.S., H. C. Summers. *Hon. Lanternist*—H. L. Davis. *Financial Secretary and Treasurer*—E. Eastwood. *Secretary*—R. Greenwood, 143 Jerningham Road, New Cross, London, S.E.

Leytonstone Camera Club.—(Established 1891.)—Meetings are held at 414 High Road, Leytonstone. *President*—Dr. W. Pickett Turner. *Vice-Presidents*—A. Horsley Hinton, Mr. Justice Byrne, W. B. Whittingham, J.P., D. J. Morgan. *Council*—C. Amor, W. J. Ball, G. E. Cox, G. H. Cricks, G. U. Haslam, M. D. Kerr, F. W. Wates, A. P. Wire, A. Woodcock. *Treasurer*—C. Andrews. *Secretary*—Albert E. Bailey, Rose Bank, South-West Road, Leytonstone. *Assistant Secretary and Lanternist*—C. A. Russell.

Lichfield Amateur Photographic Society.—(ESTABLISHED 1896.)—Meetings held at the Coffee House, Market Square. *President*—J. H. Hodson. *Vice-President*—A. W. Barnes. *Committee*—A. S. Wearing, J. Key, V. Grundy, H. E. Craven, J. Pinchers, A. E. Marshall. *Secretary and Treasurer*—E. J. Smith, 47 Trent Valley Road, Lichfield.

Light and Truth Postal Photographic Club.—(ESTABLISHED 1890.)—The objects of this Club are the mutual instruction and recreation of its members, by the circulation through the post of photographs produced by them, for criticism, exchange, &c., and also the discussion of photographic subjects. *Hon. Secretary*—T. B. Judson, 68 Broad Street, Worcester.

Lincoln Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Lincoln Coffee Palace. *President*—G. Lowe, M.D. *Vice-Presidents*—Rev. Canon Fowler, Rev. A. F. Wilson, Dr. P. Sharp. *Committee*—J. A. Graves, R. C. Minton, G. Tuckwood, jun., C. W. Witted, G. Grierson, F.L.S., G. Keyworth. *Treasurer*—C. Nelson. *Secretary*—W. E. Asquith, 24 Altham Terrace, Lincoln.

Liverpool Amateur Photographic Association.—(ESTABLISHED 1863.)—Meetings held at Percy Buildings, Eberle Street, Liverpool. *President*—Dr. J. W. Ellis, F.E.S. *Vice-Presidents*—W. Prior Christian and E. Rimbault Dibdin. *Council*—A. Tyrer, Paul Lange, F. Anyon, Rev. W. Smith, John H. Welch, G. B. Newton, Jos. Earp, Dr. Llewyllen Morgan, E. L. Marriott, J. Sirett Brown, T. F. Lloyd, Henry Lupton, G. A. Carruther. *Treasurer*—P. H. Phillips. *Secretary*—Frederick A. Schierwater, Percy Buildings, Eberle Street, Liverpool.

Liverpool Central Y.M.C.A. (Photographic Section)—(ESTABLISHED 1889.)—Meetings are held at the Y.M.C.A., Mount Pleasant. *Corresponding Secretary*—Herbert Hannah, 31 Vandyke Street, Lodge Lane, Liverpool.

Liverpool Physical Society (Photographic Section).—(ESTABLISHED 1891.)—Meetings are held at University College, Liverpool. *President*—Dr. J. L. Howard. *Treasurer*—C. A. Depeuse. *Secretary*—Dr. Charles A. Kohn, University College, Liverpool.

Llandudno Camera Club and Lantern Society.—(ESTABLISHED 1892.)—Meetings held at the Club Rooms, Bodhyfryd Road, Llandudno. *President*—Right Hon. Lord Mostyn. *Vice-Presidents*—Dr. Dalton, Elias Jones, A. H. Hughes *Committee*—Messrs. Campbell, Watterson, Dean, Sutton, and King. *Treasurer*—William Williams. *Secretary*—A. Ernest Deacon, Bodhyfryd Road, Llandudno.

London and Provincial Photographic Association.—(ESTABLISHED 1882.)—Meetings held at the White Swan, Tudor Street, Whitefriars, E.C., every Thursday evening. *Trustees*—A. Haddon and J. B. B. Wellington. *Committee*—Messrs. Bayston, R. Beckett, R. P. Drage, J. E. Hodd, A. Mackie, E. J. Wall, H. Snowden Ward, W. D. Welford. *Curator*—F. B. Grundy. *Recorder*—A. W. W. Bartlett. *Librarian*—H. C. Rapson. *Secretary and Treasurer* — T. E. Freshwater, F.R.M.S., 45 Torriano Avenue, N.W.

Longton and District Photographic Society.—(Established 1894.)—Meetings held at the Endowed School, Trentham Road, Longton. *President*—Dr. A. Parkes, M.R.C.S., L.R.C.P., &c. *Vice-Presidents*—E. Hallam and W. W. Hulse. *Committee*—T. P. Hulse, R. Prince, S. Jackson, E. H. Todd, F. T. Holford, J. Bold, W. Bates. *Treasurer*—S. Ashcroft. *Secretary*—Thomas Mottershead, 43 Stafford Street, Longton, Staffordshire.

Loughborough Photographic Society.—(Established 1888.)—Meetings held at the Photographic Rooms, Church Gate. *President*—W. C. Burder. *Committee*—Messrs. Burder, Bartlett, Brotherton, Colgrove, Clarke, Hepworth, Kelsey, Watson, and Yeomans. *Secretary*—H. Kelsey.

Louth and District Photographic Society.—(Established 1890.)—Meetings held at the Town Hall and at 8 Upgate, Louth, Lincolnshire. *President*—Rev. J. E. Standen. *Treasurer*—H. S. Forman. *Secretaries*—S. Francis Clarke, L.D.S., 8 Upgate, Louth, and Herbert C. Bentley, Apsley Villa, Grimsby Road, Louth, Lincolnshire.

Lyonsdown Amateur Photographic Society.—(Established 1886.)—Meetings held at members' houses. *President*—Frank Crosbie. *Treasurer*—Harold Imray. *Secretary*—Walter Crosbie, The Chestnuts, Lyonsdown, New Barnet.

Manchester Amateur Photographic Society.—(Established 1885.)—Meetings held at the Manchester Athenæum. *President*—J. W. Wade. *Vice-Presidents*—T. Morley Brook, James Davenport, G. E. Mellor, H. Smith. *General Committee*—H. Brownbill, F. W. Burton, S. L. Coulthurst, Rev. H. W. Dick, A. W. Duncan, T. Glazebrook, J. W. Hadfield, W. A. Hepburn, James Shaw, J. F. Tristram, M.A., B.Sc., George Wheeler, J. W. Young. *Sub-Committees*—Record: T. Morley Brook, S. L. Coulthurst, Rev. H. W. Dick, G. E. Mellor, J. F. Tristram, M.A., B.Sc. (Hon. Secretary): Society's Rooms: H. Brownbill, F. W. Burton, S. L. Coulthurst, J. W. Young, James Shaw (Hon. Secretary); Demonstrations: T. Morley Brook, Rev. H. W. Dick, T. Glazebrook, W. A. Hepburn, S. L. Coulthurst (Hon. Secretary); Survey: T. Morley Brook, C. Dawson, H. Smith, J. W. Young, S. L. Coulthurst (Hon. Secretary); Lantern: F. W. Burton, W. A. Hepburn, James Shaw, J. F. Tristram, M.A., B.Sc., C. Dawson (Hon. Secretary). The President and Secretary are *ex officio* members of all Sub-Committees. *Librarian*—J. W. Young. *Editor of Magazine*—G. E. Mellor. *Hon. Treasurer*—Charles Dawson. *Secretary*—F. W. Parrott, Ashfield Road, Altrincham.

Manchester Photographic Society.—(Established 1855.)—Meetings held at the Chamber of Commerce Rooms, 44 Mosley Street, Manchester. *President*—Jas. Wood. *Vice-Presidents*—A. E. Casson, T. Chilton, F. Edwards, W. Tomlinson, J. C. Wolfenden. *Council*—W. Blakely, J. G. Chapman, J. Evans, G. Grundy, W. Hughes, S. Knowles, J. Peddie, H. Wade, Jas. Wild, W. B. Wood. *Hon. Librarian*—F. Edwards. *Hon. Curator*—W. Tomlinson. *Hon. Reporter*—J. G. Chapman. *Hon. Treasurer*—W. G. Coote. *Hon. Secretary*—C. H. Coote, 10 Holmefield, Sale, near Manchester.

Manchester Camera Club.—(ESTABLISHED 1885.)—*Committee*—W. A. Hepburn, J. T. Foster, F. T. Overmann, J. V. Wade. *Treasurer*—James Davenport. *Secretary*—Charles Dawson, 66 Peter Street, Manchester.

Manchester Y.M.C.A. Photographic Club.—(ESTABLISHED 1890.)—Meetings held at the Y.M.C.A., 56 Peter Street, Manchester. *President*—G. T. White. *Vice-Presidents*—A. C. Harrison and W. H. Newett. *Committee*—Irving Hume, A. W. Pearson, W. H. Cheetham, W. H. Machin, Arnold Little. *Treasurer*—George Dixon. *Secretary*—J. W. Price, 56 Peter Street, Manchester.

Midland Camera Club.—(ESTABLISHED 1891.)—Meetings held at the Medical Institute, Edmund Street, Birmingham. *President*—H. R. Leech, M.R.C.S., J.P. *Vice-Presidents*—Hall-Edwards, L.R.C.P., Councillor Lancaster, C. Jevons Fowler. *Council*—T. H. Cox, J. Donaghue, William Dudley, M.R.C.S., T. J. Perry, T. Smallwood. *Hon. Treasurer*—R. J. Bailey. *Hon. Secretary*—H. Cooper, 19 Bearwood Road, Birmingham.

Midlothian Camera Club.—(ESTABLISHED 1889, REORGANIZED 1893.)—Meetings held at Edinburgh. *President*—D. Bruce Peebles. *Vice-President*—Alexander Calder. *Council*—James Hay, Alexander Dandie, R. C. Ewart. *Treasurer*—W. C. 'Callender. *Secretary*—A. D. Guthrie, Bonnington, Edinburgh.

Monklands Photographic Society.—(ESTABLISHED 1893.)—Meetings held at the New Library Buildings, Airdrie. *President*—Frank Robertson. *Vice-President*—John W. Eadie. *Committee*—John Skeil, James S. Lewis, W. B. Hossack, R. C. Platt, Robert Dunlop. *Treasurer*—Samuel H. Wood. *Secretary*—William Dixon Gray, 16 Bank Street, Airdrie.

Moseley and District Photographic Society.—(ESTABLISHED 1896.)—Meetings are held at Arnold School, Alcester Road, Moseley. *President*—Captain Davidson. *Vice-Presidents*—Dr. Hall Edwards and Dr. Ratcliffe. *Committee*—Walter Griffiths, S. P. Harris, E. W. Silk, F. Coop. *Treasurer*—W. J. Spurrier. *Secretary*—Charles H. Williams, Devonshire House, Forest Road, Moseley.

Munster Camera Club.—(ESTABLISHED 1891.)—Meetings held at the Crawford Municipal School. *President*—H. S. Noblett. *Vice-Presidents*—R. Atkins, M.A., M.D., J. Day, R. S. Baker, W. R. Atkins, J.P., K. B. Williams. *Committee*—J. Bennett, R. E. Doran, J. J. England, D. Hunter, H. Lund, Miss E. Murphy, E. Murphy, M.D., J. J. Murphy, A. Newsom, G. Percival, Alfred Roche. *Treasurer*—John Day. *Secretary*—J. J. England, Crawford Municipal School of Art, Cork.

Newcastle-upon-Tyne and Northern Counties' Photographic Association.—(ESTABLISHED 1881.)—Meetings held at the Arts Club, Grainger Street, Newcastle-on-Tyne. *President*—W. Parry. *Vice-Presidents*—J. S. B. Bell, Dr. Blacklock, J. Pattison Gibson, J. Watson. *Council*—W. E. Cowen, A. E. Cowling, William Graham, George Hall. J. J. Kirkwood, E G. Lee, H. G. Ridgway, Captain Sayers, G. L. Snowball, L. Williamson. *Treasurer*—Frederick Park. *Secretary*—William Thompson, 22 Campbell Street, Newcastle-on-Tyne. *Assistant Secretary*—W. Parker Brewis.

National Association of Professional Photographers of Great Britain and Ireland.—(ESTABLISHED 1891.)—Annual Meetings held in London, Edinburgh, Birmingham, Manchester, Leeds, &c. *President*—W. Barry (Hull). *Vice-Presidents*—J. Crosby (Rotherham), T. Fall (London), C. Lafosse (Ilfracombe), H. J. Whitlock (Birmingham). *Committee*—Harold Baker (Birmingham), T. Birtles (Warrington), Boak & Sons (Driffield), W. J. Byrne (Richmond), Chancellor & Son (Dublin), W. Davey (Harrogate), J. E. Eddison (Leeds), J. Fergus (Largs, Scotland), Wm. Gill (Colchester), Guy & Co. (Cork), T. Illingworth (Halifax), R. Keene (Burton-on-Trent), T. N. Langton (Sheffield), Jno. Martyn (Southwold), Donald McIver (Leeds), H. S. Mendelssöhn (London), John Moffat (Edinburgh), F. Whaley (Doncaster), G. V. Yates (Sheffield). *Auditors*—Harold Baker (Birmingham) and J. A. Draycott (Birmingham). *Hon. Treasurer*—W. Brookes (Manchester). *Hon. Secretary*—T. Bromwich (Bridgnorth). *Secretary*—D. J. O'Neill, 47 Charlotte Road, Birmingham.

Newton Heath Camera Club.—(ESTABLISHED 1893.)—Meetings are held a the Wesleyan School, Oldham Road. *President*—W. T. Evans. *Vice Presidents*—R. Fellows and W. J. Cresswell. *Treasurer*—J. Moodie. *Secretary*—J. Fortune, 844 Oldham Road, Newton Heath.

Newtownards Camera Club.—(ESTABLISHED 1894.)—Meetings are held at Regent Street Hall, Newtownards. *President*—Hugh Conway, B.A. *Vice-President*—S. H. Simms. *Committee*—Miss Jamison, Miss Johnston, — Paden, A. H. Moore, George Dixon. *Treasurer*—William McCulloch. *Secretary*—Thomas Drake, Hardford Lodge, Newtownards.

Northamptonshire Natural History Society and Field Club (Photographic Section).—(ESTABLISHED 1876.)—Meetings held at 8 Abington Street, Northampton. *President*—H. Manfield. *Secretaries*—G. Nichols and C. H. Dorman, 51 Abington Street, Northampton.

North Middlesex Photographic Society.—(ESTABLISHED 1886.)—Meetings held at Jubilee House, Hornsey Road, London, N. *President*—J. C. S. Mummery. *Vice-Presidents*—W. B. Goodwin, A.R.I.B.A., and E. R. Mattocks. *Council*—J. Addison, A. J. Golding, C. O. Gregory, A. J. Johnson, A. H. Lisett, J. MacIntosh, J. W. Marchant, F.R.P.S., J. A. Meen, C. R. Steele, H. Stuart. *Hon. Librarian*—F. W. Cox. *Treasurer*—Henry Smith. *Secretary*—J. Durston, 51 Landrock Road, Hornsey, N. *Assistant Secretary and Curator*—W. J. Simpson.

North Staffordshire Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Higher Grade Schools, Hanley. *President*—Bernard Howson. *Vice-Presidents*—E. B. Wain, William Hampton, H. M. Hornby, H. B. Steele. *Council*—A. E. Hils, W. E. Leek, F. C. Powell, Dr. Predergast, G. S. Turner, W. A. Meigh, E. Marks, H. P. Hopkins. *Treasurer*—Bernard Howson. *Joint Hon. Secretaries*—W. H. Walley, Queen Street, Burslem, and J. W. Moore, Tontine Square, Hanley.

Oban Amateur Photographic Society.—(ESTABLISHED 1892.)—Place of Meeting, Oban. *President*—M. A. Scott. *Vice-President*—John Maclaine. *Committee*—President, Vice-President, Secretary and Treasurer, D. Campbell Munro, John Anderson, jun. *Hon. Secretary and Treasurer*—Samuel Lawrence, Chemist, Oban.

Oldham Photographic Society.—(ESTABLISHED 1867.)—Meetings held at the Lyceum, Union Street, Oldham. *President*—James Brooks. *Vice-President*—James Hall. *Committee*—T. Burton, J. S. Dronsfield, J.P., J. Greaves, jun., C. A. Hempstock, F. Megson, W. A. Nash, R. T. Taylor, J. Fullalove. *Treasurer*—Tom Heywood. *Hon. Secretary*—Thomas Widdop, 17 Queen Street, Oldham.

Oxford Camera Club.—(ESTABLISHED 1894.)—Meetings held at the University Museum. *President*—Sir William J. Herschel, Bart. *Vice-Presidents*—Miss Acland, Colonel Impey, E. A. Ryman Hall, V. P. Sells. *Committee*—T. E. Horrigan, E. C. H. Jessop, T. Minn, G. Shelton, Dr. M. D. Stark, Miss Venables, J. B. Wilson. *Treasurer*—R. A. R. Bennett. *Secretary*—George W. Norton, 13 Park Terrace, Oxford.

Oxford University Photographic Society.—(ESTABLISHED 1882.)—Headquarters, 24 Friars Entry, Oxford. *Secretary*—H. W. Hallifax, Balliol College, Oxford.

Paisley Photographic Society.—(ESTABLISHED 1857, REORGANIZED 1885.)—Rooms, 9 Gauze Street, Paisley. *Hon. Presidents*—H. H. Smiley and Stewart Clarke. *Hon. Vice-Presidents*—Robert Harris, James Donald, jun., James Barr, A. F. McCallum. *President*—Thomas Rastall. *Vice-President*—Robert Ferrier. *Council*—Edward Cook, James Mure, Charles Glassford, Robert Milne, James Reid, and James Arthur; Lantern Section: David B. Jack, James Mure, Charles Glassford. *Treasurer*—David B. Jack. *Secretary*—Robert M. Alexander, 2 Gordon Place, Paisley.

Peterborough Photographic Society.—(ESTABLISHED 1887.)—Meetings held at the Bedford Temperance Hotel. *President*—G. Kirkwood, M.D. *Vice-Presidents*—Dr. T. J. Walker, E. Worthington, G. W. Leigh. *Committee*—T. J. Calcutt, W. H. Pentrey, J. F. Perkins, J. Scotney, A. C. Taylor. *Treasurer*—W. Atkinson. *Secretary*—A. W. Nicholls, 11 Cromwell Road, Peterborough.

Photographic Club.—(ESTABLISHED 1879.)—Meetings are held at Anderton's Hotel, Fleet Street, London, E.C., every Wednesday evening at Eight o'clock. *Trustees*—Frank Haes and Alexander Cowan. *Committee*—E. Crofton, R. P. Drage, E. W. Foxlee, A. Mackie, E. A. Newell, W. D. Welford, J. B. B. Wellington, J. R. Williams. *Recorder* (*pro tem.*)—W. D. Welford. *Curator and Librarian*—Charles Wallis. *Hon. Secretary and Treasurer*—F. A. Bridge, East Lodge, Dalston Lane, London, N.E.

Photographic Copyright Union.—*President*—Frank Bishop (Marion & Co.). *Vice-President*—Joseph J. Elliott (Elliott & Fry). *Committee*—J. Lillie Mitchell (London Stereoscopic Company), Hon. Secretary; Warwick Brookes, Manchester; William Crooke, Edinburgh; William Downey (W. & D. Downey); E. Frith (Frith & Co.), Reigate; James Lafayette, London, Dublin, &c.; William Magrath (Guy & Co., Ltd.), Cork and Limerick; Frank M. Sutcliffe, Whitby; Louis Wilson (G. W. Wilson & Co., Ltd.), Aberdeen. *Treasurer*—William Grove (Window & Grove). *Secretary*—Henry Gower, London Chamber of Commerce, Botolph House, Eastcheap, E.C.

Photographic Convention of the United Kingdom.—(ESTABLISHED 1886.)—Meeting at Glasgow in July, 1898, under the Presidency of John Stuart. Retiring President (Great Yarmouth, 1897), F. P. Cembrano. The Photographic Convention was founded in 1885 for the advancement of photography, and to afford opportunities for personal intercourse and exchange of ideas amongst those interested in the art, from all parts of the United Kingdom. The Council of the Convention is empowered to make grants from the surplus funds under its control, in aid of photographic research. Meetings have been held in the following centres:—Great Yarmouth, Leeds, Shrewsbury, Dublin, Plymouth, Edinburgh, Bath, Chester, London, Birmingham, Glasgow, Derby. *Past Presidents*—H. P. Robinson, A. Haddon, Sir Howard Grubb, George Mason, William Bedford, G. Davison, C. H. Bothamley, Andrew Pringle, J. Traill Taylor. *Former Hon. Secretaries*—J. J. Briginshaw, F. P. Cembrano, R. P. Drage. *Council*—Surgeon-Major Adcock (Great Yarmouth), Harold Baker (Birmingham), Thomas Bedding (London), C. H. Bothamley (Weston-super-Mare), J. J. Briginshaw (London), F. A. Bridge (London), Alexander Cowan (London), W. Crooke (Edinburgh), Sir Howard Grubb (Dublin), Herbert Denison (Leeds), A. Haddon (London), H. M. Hastings (London), A. Horsley Hinton (London), Sydney Keith (London), Paul Lange (Liverpool), C. Phipps Lucas (London), Percy Lund (Bradford), J. L. Lyell (London), Major Lysaght (London), George Mason (Glasgow), A. F. Mowll (Liverpool), W. W. Naunton (Shrewsbury), J. Porritt (Leicester), Andrew Pringle (London), H. P. Robinson (Tunbridge Wells), J. C. Ruthven (Dublin), A. Seaman (Chesterfield), John Stuart (Glasgow), Henry Sturmey (Coventry), W. Taylor (Leicester), Alexander Tate (Belfast), E. J. Wall (London), J. H. Walker (Leeds), H. Snowden Ward (London), G. Watmough Webster (Chester), S. B. Webber (London), W. D. Welford (London), J. B. B. Wellington (London), A. Werner (Dublin), F. W. Williams (Shrewsbury). Martin J. Harding (Shrewsbury), Godfrey Bingley (Leeds), Harvey George (Great Yarmouth), are *ex-officio* members of Council for one, two, and three years respectively. *Trustees*—F. A. Bridge and S. B. Webber. *Auditors*—Thomas Fall and John Howson. *Hon. Secretary and Treasurer*—F. A. Bridge, East Lodge, Dalston Lane, London, N.E.

Photographic Society of Ireland.—(ESTABLISHED 1854.)—Meetings held at 35 Dawson Street, Dublin. *President*—Alfred Werner, F.R.P.S. *Vice-Presidents*—J. A. C. Ruthven, A.M.I.C.E., and J. H. Hargrave, B.A. *Council*—A. M. Geddis, James Simpson, J. Armstrong, J. E. Matthews, J. M. Keogh, H. Goodwillie, R. M. Inglis, J. H. Gane, E. R. McC. Dix. *Hon. Treasurer*—William Bewley, B.A. *Hon. Secretary*—Victor E. Smyth, 7 Uxbridge Terrace, Ranelagh, Dublin. *Assistant Secretary*—W. F. Cooper, 194 Clonliffe Road, Dublin.

Photographic Survey of Warwickshire.—(ESTABLISHED 1890.)—Meetings held at Birmingham. *President*—Sir J. B. Stone, M.P. *Vice-Presidents*—Jethro A. Cossins and Jonathan Pratt. *Treasurer*—G. F. Lyndon, J.P. *Secretaries*—J. H. Pickard, Priory Road, Edgbaston, Birmingham, and C. J. Fowler, Court Mount, Erdington.

Photographic Salon.—(ESTABLISHED 1892.)—Meetings held at the Dudley Gallery, Piccadilly, W. *Committee*—A. Alexandre, Bernard Alfieri, J. Craig Annan, Ernest R. Ashton, Lionel C. Bennett, J. S. Bergheim, Shapoor N. Bhedwar, Valentine Blanchard, Maurice Brémard, Rowland Briant, Tom Bright, T. M. Brownrigg, Maurice Bucquet, Arthur Burchett, A. Buschbek, W. A. Cadby, Eustace Calland, H. Hay Cameron, Lyonel Clark, Francis Cobb, Lewis Cohen, Hector Colard, Walter L. Colls, Reginald W. Craigie, William Crooke, L. David, George Davison, S. Day, Robert Demachy, R. Eickemeyer, Charles Emanuel, J. Gale, John Pattison Gibson, Karl Greger, J. C. M. Grove, Hugo Henneberg, A. Hildesheimer, Alfred Horsley Hinton, Frederick Hollyer, Heinrich Kühn, George H. James, Rouillé Ladevèze, Rev. F. C. Lambert, Baron Alfred Liebieg, Thomas Manly, Alfred Maskell, Charles Moss, C. Puyo, H. P. Robinson, Ralph Robinson, Baron N. de Rothschild, Lyddell Sawyer, Otto Scharf, Alfred Stieglitz, J. Strakosch, Frank M. Sutcliffe, Carl Ulrich, Hans Watsek, J. B. B. Wellington, H. Van der Weyde, B. Gay Wilkinson, jun., W. Willis. *Hon. Secretary*—Alfred Maskell, Dudley Gallery, Piccadilly, W.

Plymouth Photographic Society.—(ESTABLISHED 1895.)—Affiliated with the Royal Photographic Society. Meetings are held each alternate Friday at the Mechanics' Institute, Princess Square, Plymouth. *President*—E H. Micklewood. *Vice-Presidents*—W. Aver Duncan and H. S. Hill. *Committee*—W. E. Drinkwater, — Johns, F. Johnson, J. Davy Turney, J. Truand Trend. *Auditor*—W. H. Mayne. *Treasurer*—Thomas Stanning. *Secretary*—W. H. Harris, 91 Coburg Street, Plymouth.

Plympton Photographic Society.—(ESTABLISHED 1893.)—*President*—C. Aldridge, M.D. *Council*—Dr. Ellery, Dr. Stevens, H. Tritton, J. Brookny Rowe. *Secretary and Treasurer*—T. H. Wilks, Plympton House, Plympton, Devon

Polytechnic Photographic Society.—Meetings are held every Wednesday at 309 Regent Street, in Room 14, at 8.15 p.m. Lantern night, last Wednesday in each month. *President*—Howard Farmer. *Committee*—G. Goose, J. E. Galliford, R. Hill, W. T. Pearson, W. M. Weir, F. Wilson. *Treasurer*—H. Bacon. *Hon. Secretary*—F. W. Parker 76 Patshull Road, N.W. *Assistant Hon. Secretary*—H. A. Baxter.

Poole Natural History Society.—(ESTABLISHED 1888, THE PHOTOGRAPHIC SECTION 1897.)—Meetings are held at the Free Library Buildings, Poole. *President*—Reginald Aldridge. J.P. *Vice-Presidents*—Dr. W. Hooper Masters and Dr. William Turner, J.P. *Committee*—A. D. Moullin, Leonard W. Pike, Owen Carter, W. H. Hunt. *Treasurer*—Charles Carter, J.P. *Secretary*—John M. Henderson, Belle Vue, Hamworthy, Poole.

Postal Camera Club.—(ESTABLISHED 1894.)—A circulating Club for the criticism of prints by members, and mutual aid on matters photographic. The portfolios (of which there are four) circulate regularly. Prints are inserted and withdrawn by the members as the portfolio receives them monthly. *Hon. Secretary*—W. R. Bland, Duffield, Derby.

Postal Photographic Club.—(ESTABLISHED 1886.)—Headquarters, Walton Manor Lodge, Oxford. Formed for the circulation and exchange of prints, and discussions on various matters of photographic interest. Criticisms are made on the prints circulating by the members. Prints are inserted by members as the cases reach them (about once a month). *Secretary and Treasurer*—Reginald A. R. Bennett, M.A. (Oxon.), Walton Manor Lodge, Oxford.

Postal Photographic Competition Club.—(ESTABLISHED 1893.)—Circulating Club for advanced workers only. *Secretary*—Hugo Meynell, Farley, Cheadle, Stoke-on-Trent.

Prescot and District Amateur Photographic Association.—(ESTABLISHED 1897.)—Meetings held at Bank Buildings, Derby Street, Prescot. *Committee*—J. Blaiklock (Chairman), F. V. Driffield (Vice-Chairman), A. Tracey, F. R. Thomas, J. S. Robinson, E. Martin, J. Whitaker, E. Davies. *Hon. Treasurer*—C. T. Willis. *Hon. Secretary*—W. Langley, Plumbs House, Scotch Lane, Prescot.

Preston Scientific Society Photographic Section.—(ESTABLISHED 1896.)—Meetings held at the Society's Room, Cross Street. *Chairman*—James Busby. *Committee*—Henry Atherton, James Atherton, C. E. Gray, C. Carter, J. Marsden, Dr. Derham. *Secretary*—Frank Ketton, Oak Cottage, Fulwood, Preston.

Putney Photographic Society.—(ESTABLISHED 1890.)—Meetings are held at the Schoolroom, 102 High Street, Putney, S.W. *President*—The Hon. Baron Pollock. *Vice-Presidents*—John A. Hodges, F.R.P.S., H. Kimber, M.P., Dr. W. J. Sheppard. *Council*—F. Chasemore, Dr. J. F. Farrar, H. Faulkner, T. Gilbert, W. F. Gorin, William Martin, W. C. Plank, Dr. C. Wyman, L. S. Zachariasen. *Treasurer*—William Martin. *Secretaries*—William Martin, 4 Lower Parkfields, Putney, S.W., and W. J. Colebrook, 18 Festing Road, Putney, S.W.

Ramsgate Camera Club.—(ESTABLISHED 1894.)—Meetings are held at the Victoria Hotel, Ramsgate. *Vice-Presidents*—E. E. Wastall, J.P., W. T. Davey, W. C. Bull. *Committee*—F. B. Bear, T. J. Dutton, A. F. Dawkins, G. Hoile, A. W. Kingsland, W. T. Lambert, T. B. Smith, J. M. Vickery, H. G. Holloway, R. J. Smith. *Treasurer*—Frederick J. Bear, jun. *Secretary*—Frederick J. Bear, 41 Queen Street, Ramsgate.

Redditch Institute (Photographic Section) (late Redditch Amateur Photographic Society).—Meetings are held at the Redditch Institute. *Chairman*—H. Page, M.D. *Hon. Secretary*—Alfred Parr, The Hollies, Beoley.

Richmond Camera Club.—(ESTABLISHED 1890.)—Meetings held at the Greyhound Hotel, Richmond, Surrey. *Patron*—H.H. the Duke of Teck. *President*—F. P. Cembrano. *Vice-Presidents*—E. D. Purcell and G. Ardaseer. *Committee*—J. H. Alabaster, C. J. M. Child, J. D. Gibson, J. W. St. John Hunt, F. Neville, G. O. Richards. *Treasurer*—J. B. Huddy. *Secretary*—C. H. Davis, 97 Church Road, Richmond, Surrey.

Rochdale and District Photographic Society.—(ESTABLISHED 1890.)—*President*—J. A. Bright. *Vice-Presidents*—Alderman J. R. Heape, Rev. T. P. Spedding, C. Fairbank, F. W. Turner, Dr. W. Mills, Colonel C. M. Royds, M.P. *Committee*—G. H. Bray, F. Greenwood, G. Smith, G. A. Close, E. H. Seanor, W. Ingham, D. E. Brooks, R. Whitehead, J. Fitton, J. S. Johnson. *Treasurer*—R. J. Mills. *Secretaries*—H. & W. Bamford 242 Yorkshire Street, Rochdale.

Rochester Naturalists' Club (Photographic Section).—(ESTABLISHED 1892.)—Meetings held at the Mathematical School, Rochester. *Secretary*—J. Hepworth, Linden House, Rochester.

Rock Ferry Camera Club.—(ESTABLISHED 1895.)—Meetings are held at St. Peter's Hall, Rock Ferry. *Committee*—C. Sunderland, A. R. Jenkins, C. Hill, Hamilton Williams. *Treasurer*—R. A. Armstrong. *Secretary*—J. W. Kelly, Egerton Park, Rock Ferry.

Rodley Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at Rodley. *President*—W. Broughton. *Committee*—J. W. Nicholson, H. Hardaker, J. Slater, Walter Smith, Tom Lambert. *Treasurer*—H. Crossley. *Secretaries*—H. Crossley and John Hardaker, Rodley, near Leeds.

Romford and District Photographic Society.—(ESTABLISHED 1894.)—Meetings held at High Street, Romford. *President*—W. E. Gibb, J.P. *Vice-President*—A. Money Wigram. *Committee*—C. Hussey, A. G. Lucas, C. S. Marsh, A. E. Michell, C. G. Church, T. J. Day, G. W. Corbell, C. G. Reed, R. T. Aldous. *Treasurer*—J. W. Lasham. *Secretary*—A. J. Ormiston, Stylehurst, Romford.

Rossendale Camera Club.—(ESTABLISHED 1892.)—Meetings held at the Blue Ribbon Club, Rawtenstall. *President*—J. R. Butterworth. *Vice-Presidents*—J. Taylor and W. T. Entwistle. *Committee*—Messrs. Poynton, Nelson, Grime, Simpson, and Taylor. *Treasurer*—W. A. Fenton. *Secretary*—E. R. K. Taylor, 23 Bank Street, Rawtenstall, near Manchester.

Rotherham Photographic Society.—(ESTABLISHED 1889.)—*President*—Dr. Baldwin. *Vice-Presidents*—E. Isle Hubbard, J. Leadbeater, J. Turner. *Council*—The Officers, and R. H. Law, J. Clarke, F. Oldham, F. Moore. *Hon. Treasurer*—A. S. Lyth. *Hon. Secretary*—H. C. Hemmingway, Grosvenor Terrace, Tooker Street, Rotherham. *Assistant Secretary*—C. E. Parkin.

Royal Cornwall Polytechnic Society.—(ESTABLISHED 1833).—Meetings held at Falmouth. *President*—T. Bedford Bolitho, M.P. *Vice-Presidents*—Right Hon. Viscount Falmouth, E. W. Bayley, F.E.S., F.L.S., J. D. Enys, F.G.S., J. Passmore Edwards, Professor T. E. Thorpe, F.R.S., J. Bevill Fortescue, William Brookes, John Stephens, M. H. Williams, Stanhope Forbes, A.R.A., John J. Beringer, F.C.S., George H. Fox. *Treasurer*—R. Milford Tweedy. *Secretary*—Edward Kitto, F.R.Met.S., The Observatory, Falmouth.

Royal Photographic Society.—(ESTABLISHED 1853.)—Meetings are held at 12 Hanover Square, London, W. *President*—The Right Hon. the Earl of Crawford, K.T., F.R.S. *Vice-Presidents*—T. R. Dallmeyer, F.R.A.S., Chapman Jones, F.I.C., F.C.S., John Spiller, F.I.C., F.C.S., Sir H. Trueman Wood, M.A. *Council*—T. Bedding, T. Bolas, F.I.C., F.C.S., F. A. Bridge, J. Cadett, A. Cowan, W. E. Debenham, A. Haddon, F. E. Ives, Rev. F. C. Lambert, M.A., A. Mackie, J. W. Marchant, J. C. S. Mummery, A. Pringle, F.R.M.S., J. A. Sinclair, Arnold Spiller, F.I.C., J. W. Swan, M.A., F.R.S., E. J. Wall, H. Snowden Ward, Leon Warnerke, Paul L. Waterlow. *Librarian*—Edgar Clifton. *Solicitor*—Francis Ince. *Treasurer*—George Scamell. *Secretary*—Horace Wilmer, Grove Hill, South Woodford. *Assistant Secretary*—R. Child Bayley, 12 Hanover Square, London W.

Scarborough and District Photographic Society.—(ESTABLISHED 1892.)—Meetings held in the Museum, Scarborough. *President*—Dr. Frederick Dale. *Vice-President*—J. H. Rowntree. *Committee*—Miss M. McAllum, Miss Graham, Dr. Harvey, J. C. Thompson, J. Whitfield, E. R. Cross. *Treasurer*—J. G. Megginson. *Hon. Secretary*—H. Wanless, 31 Westborough, Scarborough.

Selby Camera Club.—(ESTABLISHED 1878.)—Meetings are held at the Club Rooms, Park Street. *President*—William Rawling. *Vice-Presidents*—J. C. Thompson and J. T. Atkinson. *Council*—Messrs. Cooper, Allison, Watson, Morley. *Secretary and Treasurer*—W. N. Cheesman, The Crescent, Selby.

Shaw Church Institute Photographic and Art Society.—(ESTABLISHED 1888.)—Meetings held at the Shaw Church Institute. *President*—H. Illingworth. *Vice-President*—J. H. Broadbelt. *Committee*—J. R. Royds, J. Watson, J. Clarkson. *Secretary and Treasurer*—John Maiden, 91 Rochdale Road, Shaw.

Sheerness Camera Club.—(ESTABLISHED 1896.)—Meetings held at 3 Russell Street. *President*—J. J. King-Salter. *Vice-President*—J. Small. *Committee*—E. J. White, W. Shutt, A. Doran. *Hon. Treasurer*—W. H. Jago. *Hon. Secretary*—Arthur D. L. Hughes, 14 Edward Street, Sheerness-on-Sea.

Sheffield and Hallamshire Photographic Society.—(ESTABLISHED 1896.)—Meetings are held at the Crown and Anchor Hotel, Fitzwilliam Street, Sheffield. *President*—L. Britton. *Vice-President*—G. H. Bagshaw. *Committee*—F. Evans, R. Heathcote, J. Cartledge, F. Oakes, J. Cunningham, Jos. Robinson, — Birch, — Pashley. *Treasurer*—Jno. W. Mottershaw. *Secretary*—Fred. Lowe, 361 Sharrow Vale Road, Sheffield.

Sheffield Photographic Society.—(ESTABLISHED 1875.)—Meetings are held at the Masonic Hall, Surrey Street, Sheffield. *President*—G. Tomlinson. *Vice-Presidents*—T. Firth, D. C. Brooke, S. Camp. *Council*—W. T. Furniss, G. H. Day, H. Ellis, J. W. Charlesworth, C. F. Brindley. *Librarian*—T. G. Hibbert. *Reporter*—J. H. Lygo. *Treasurer and Assistant Secretary*—Joseph Smith. *Secretary*—George W. Blackwell.

Sheffield Optical Lantern Society.—(Established 1891.)—Meetings held at St. Paul's Schoolroom, Cambridge Street, Sheffield. *President*—Dr. Manton. *Vice-Presidents*—J. H. Lygo, J. Clowes, H. Staniforth, J. W. H. Wilson, A. Nicholson. *Treasurer*—J. W. Copley. *Secretary*—T. G. F. Allen, 59 Melrose Road, Sheffield.

Shields and District Camera Club.—(Established 1893.)—Meetings held at the Studio, Albion Road, North Shields. *President*—Thomas Simpson. *Vice-Presidents*—Miss Phillips and R. W. Tate. *Committee*—William Bell, J. Guy, R. Newham, J. Blyth. *Secretary and Treasurer*—William S. Irvin, Bedford House, North Shields.

Shropshire Camera Club.—(Established 1886.)—Meetings held at Castle Chambers, Shrewsbury. *President*—W. E. Harding. *Vice-Presidents*—M. J. Harding, F. W. Williams, W. D. Haydon. *Council*—F. R. Armitage, W. Bowdler, C. W. Ebrall, R. J. Irwin, P. W. Pilcher. *Treasurer*—Wallace Heath. *Secretary*—J. L. Della Porta, The Mount, Shrewsbury.

Society for the Encouragement of Arts, Manufactures, and Commerce.—(Founded in 1754. Incorporated by Royal Charter in 1847.)—Meetings are held at John Street, Adelphi, London, W.C. *Council*—H.R.H. the Prince of Wales, K.G. (President of the Society), Major-General Sir Owen Tudor Burne, G.C.I.E., K.C.S.I. (Chairman of the Council), H.R.H. the Duke of Saxe-Coburg-Gotha, K.G. (Vice-President), H.R.H. the Duke of York, K.G. (Vice-President), Sir Frederick Abel, Bart., K.C.B., D.C.L., F.R.S. (Vice-President), Duke of Abercorn, K.G., C.B. (Vice-President), Captain W. de W. Abney, R.E., C.B., F.R.S. (Vice-President), Sir William Anderson, C.B., D.C.L., F.R.S. (Vice-President), The Attorney-General, G.C.M.G., Q.C., M.P. (Vice-President), Sir Steuart Colvin Bayley, K.C.S.I., C.I.E., Lord Belhaven and Stenton, Sir George Birdwood, K.C.I.E., C.S.I., LL.D., M.D. (Vice-President), Sir Edward Birkbeck, Bart. (Vice-President), Sir Courtenay Boyle, K.C.B. (Vice-President), Sir Frederick Bramwell, Bart., D.C.L., F.R.S. (Vice-President), Michael Carteighe, B. Francis Cobb (Treasurer), Right Hon. Viscount Cross, G.C.B. (Vice-President), Right Hon. George N. Curzon, M.P. (Vice-President), Lewis Foreman Day, Major-General Sir John F. D. Donnelly, K.C.B. (Vice-President), Hon. Sir Charles W. Fremantle, K.C.B. (Vice-President), Sir Douglas Galton, K.C.B., D.C.L., F.R.S. (Vice-President), Joseph G. Gordon, Henry Graham Harris, Sir Villiers Lister, K.C.M.G. (Vice-President), The Lord Chancellor (Vice-President), James Sewell Neville, William Henry Preece, C.B., F.R.S. (Vice-President), Sir Owen Roberts, M.A., D.C.L., F.S.A. (Treasurer), Professor William Chandler Roberts-Austen, C.B., F.R.S. (Vice-President), Earl of Rosebery, K.G., K.T. (Vice-President), Alexander Siemens, Sir Donald A. Smith, G.C.M.G., LL.D. (Vice-President), Sir Douglas Straight, William Luson Thomas, Professor John Millar Thomson, F.R.S. *Auditors*—J. O. Chadwick & Co. *Accountant*—Howard H. Room. *Secretary*—Sir Henry Trueman Wood, M.A. *Assistant Secretary*—**Henry B. Wheatley, F.S.A.**

Smethwick and District Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Hill Street Schools, Smethwick. *President*—Dr. J. Pitt. *Committee*—F. Read, — Gregory, A. Jeffery, G. Lee, W. Howlett. *Treasurer*—Mr. Grant. *Secretary*—A. Highfield, 63 Regent Street, Smethwick.

South London Photographic Society.—(ESTABLISHED 1888.)—Meetings held on first and third Mondays at Hanover Hall, Hanover Park, Rye Lane, Peckham, S.E. Affiliated with the Royal Photographic Society. *Patron*—His Grace the Duke of Newcastle. *Vice-Presidents*—H. E. Farmer, S. W. Gardner, Maurice Howell, T. G. Munyard, L.R.C.P., &c., W. F. Slater, W. D. Welford. *Committee*—W. C. Boyce, E. R. Bull, C. F. Dickinson, H. Esler, A. Fellows, F. W. Grigg, W. R. Jarvis, B. Lyon, G. A. Maull. *Curator*—G. H. Moss. *Hon. Lanternist*—J. T. French. *Captain of the Cylist Members*—E. G. Ruckes. *Vice-Captain*—F. A. Cooper. *Delegates to the Affiliation of Photographic Societies*—Charles H. Oakden and W. D. Welford. *Hon. Treasurer*—E. A. Whitby. *Hon. Secretary*—Charles H. Oakden, 30 Henslowe Road, East Dulwich, S.E. *Hon. Assistant and Excursion Secretary*—A. E. Allen, 27 Princes Square, Kennington, S.E.

Southport Social Photographic Club.—(ESTABLISHED 1890.)—Meetings are held at The Studio, 15 Cambridge Arcade. *President*—Charles H. Brown. *Vice-Presidents*—D. E. Benson, A.M.I.C.E., and H. L. Hawksley, L.R.C.P. *Committee*—Henry Ball, W. P. Brown, H. J. Heaton, T. Ormrod, W. Rees. *Treasurer*—James R. Cane, A.P.S. *Secretary*—George Cross, 15 Cambridge Arcade, Southport.

Southsea Amateur Photographic Society.—(ESTABLISHED 1888.)—Meetings held at 5 Pembroke Road, Portsmouth. *President*—A. Fisher, A.S.A. *Vice-President*—G. Whitefield. *Committee*—Colonel C. Wilkinson, R.E., F.R.P.S., Colonel H. W. B. Bruno, C. H. Grant, Dr. C. H. Newby, F.R.C.S., G. Wood, A.R.I.B.A., F. J. Mortimer. *Treasurer*—Dr. F. Lord. *Secretary*—H. T. Lilley, M.A., 22 Pelham Road, Southsea.

Spalding and District Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at Spalding. *President*—W. A. Southwell. *Vice-Presidents*—G. F. Barrell and A. K. Maples. *Committee*—H. B. Massey, E. M. M. Smith, W. Stedmans. *Secretary and Treasurer*—E. Wightman Bell, F.C.S., High Bridge, Spalding.

Stafford Photographic Society.—(ESTABLISHED 1895.)—Meetings held at the Y.M.C.A. Rooms, Stafford. *President*—George Wray. *Vice-Presidents*—H. E. Burn. *Committee*—W. Kirkham, H. Cliff, T. Davies, F. Jenkinson. *Secretary and Treasurer*—Frank Cliff, 11 Gaol Gate Street, Stafford.

St. Bartholomew's Hospital Photographic Society.—(ESTABLISHED 1886.)—Headquarters, St. Bartholomew's Hospital. *Vice-Presidents*—Dr. Lewis Jones and F. Womack. *Hon. Secretary*—P. G. Harvey.

Stereoscopic Club.—(ESTABLISHED 1890.)—Meetings are held at Brooklands Hotel. *President*—James Whitelegg. *Treasurer*—F. Hallewell. *Secretary*—W. I. Chadwick, Westwood, Sale, Cheshire.

Stereoscopic Society.—(Established 1893.)—*President*—W. W. Stainthorpe, M.D., J.P. *Vice-President*—Ringrose Atkins, M.A., M.D, *Secretary and Treasurer*—B. Diveri, B.A., Huntly, N.B.

St. Helens and District Photographic Society.—(Established 1894.)—Headquarters, Wolverhampton House, Church Street, St. Helens. *Vice-Presidents*—Colonel Gamble, C.B., D. McKechnie, J.P., F. R. Dixon-Nuttall, J.P., R. G. Brook, W. Thomason, C. H. Jolliffe, Rev. J. W. Willink. *Council*—J. Cammack, L. West, J. Westworth, J. G. Wallbridge, W. W. Gandy, A. M. Booth, D. Thomason, J. C. Nicol. *Hon. Secretary*—J. G. Wallbridge, 52 Liverpool Road, St. Helens, Lancashire.

St. Michael's Junior Photographic Society.—(Established 1896.)—Meetings held at the Church Room, Belgrave Road. *President*—Rev. H. Gresford Jones, M.A. *Secretary*—Henry Goldstone, 66 Alwyn Street, St. Michael's, Liverpool.

Stockport Photographic Society.—(Established 1890.)—Meetings held at the Mechanics' Institute. *President*—Colonel Turner, J.P. *Vice-Presidents*—G. Hidderley, E. Johnson, A. M. Gourley. *Council*—J. G. Howarth, J. Rushton, J. Middleton, R. J. Bailey, J. Lingard, J. Brelsford, W. H. Atherton, H. D. F. Dobson, J. N. Dempsey. *Treasurer*—Thomas Bedford. *Secretary*—Thomas Allott, 108 Shaw Heath, Stockport.

Stoneycroft Camera Club.—(Established 1895.)—Meetings are held in the People's Hall, 509 Prescot Road, Stoneycroft, Liverpool. *President*—R. H. Mitchell, A.P.S.Lond. *Vice-President*—W. Bennett. *Council*—J. Canavan, C. E. Hancox, F. Walmsley, F. Drakeford, H. Johnson. *Treasurer*—T. Reginald Olver. *Secretary*—S. Roger-Midgley, 3 Derby Lane, Stoneycroft, Liverpool.

Streatham Photographic Society.—(Established 1895.)—Meetings held at 14 Greyhound Lane, Streatham Common. *President*—Dr. E. Gordon Hull. *Vice-President*—J. D. B. Lewis. *Committee*—H. Taylor, W. Bennett, E. R. Creed, T. Moyser, T. Benger, H. G. Coombs. *Lanternist*—H. R. Coombs. *Secretary*—John J. Laws, Chemist, 14 Greyhound Lane, Streatham, S.W. *Assistant Secretary*—A. W. James, 36 Tankerville Road, Streatham, S.W.

Sun & Company.—(Established 1886.)—A Postal Photographic Society for advanced workers, limited to forty amateurs, for the monthly circulation and criticism of photographs, entirely the work of members, and for a general interchange of ideas, with a view to mutual advancement in the science and art of photography. *Committee*—F. de Paula, Wallace Heath, Henry Newson, and the Hon. Secretary. Application for vacancies should be made to the Hon. Secretary, Martin J. Harding, 6 Havelock Road, Shrewsbury.

Sunbeam Postal Photographic Society.—(Established 1894.)—An ever-circulating portfolio society, monthly portfolios for mutual criticism, exchanges, and discussions, with occasional competitions among members. *Secretary and Conductor*—R. W. Copeman, Kuklos Cottage, Henstridge, Blandford.

Sunderland Photographic Association.—(ESTABLISHED 1888.)—*President*—W. Milburn. *Vice-Presidents*—W. Bartram and C. E. Cowper. *Council*—G. Bartram, A. G. Boulton, J. W. Broderick, W. Horan, E. R. Kirkley, A. Peddie, R. G. Posgate, W. Pratt. *Treasurer*—T. Walton. *Secretary*—W. J. Pope, New Arcade, Sunderland.

Sutton Photographic Club (in connexion with the Sutton Scientific and Literary Society).—(RECONSTITUTED 1897.)—*Chairman*—J. A. Formoy, F.R.A.S. *Vice-Chairman*—E. De Clifford, B.A. *Secretary*—A. P. Hoole, The Willows, Sutton, Surrey.

Talbot Album Club.—(ESTABLISHED 1886.)—*Secretary*—Frederick H. Davies, Shustoke House, Stechford, Birmingham.

Technical College, Finsbury, Photographic Society.—(ESTABLISHED 1886.)—Meetings held at the Finsbury College, Leonard Street, City Road, E.C. *President*—R. Meldola, F.R.S., F.I.C., F.C.S. *Vice-President*—J. Castell Evans, F.I.C. *Treasurer and Librarian*—T. H. Norris, A.I.C. *Secretary*—W. L. C. Butter, 10 Jackson Street, Woolwich Common.

The Park Photographic Society.—(ESTABLISHED 1894.)—Meetings held at the Domestic Mission, Mill Street, Dingle, Liverpool. *President*—T. Lee Lloyd. *Vice-Presidents*—Dr. Foulston and R. Coventry. *Treasurer*—Edward Warwick. *Secretary*—Alexander Mair, 337 Grafton Street, Liverpool.

Tunbridge Wells Amateur Photographic Association.—(ESTABLISHED 1887.) Meetings held at the Club Room, Mechanics' Institute. *Patrrn*—Sir David Salomons, Bart., M.A., D.L., J.P. *President*—Francis G. Smart, M.A., F.S.A., F.L.S. *Vice-Presidents*—Rev. A. T. Scott, M.A., E. R. Ashton, C. Leeson Prince, F.R.A.S., F.R.Met.S. *Committee*—G. W. Howard, F.C.S., J. W. Morgan, A. W. Pierson. *Hon. Auditor*—E. Catchpole. *Hon. Treasurer*—B. Whitrow. *Hon. Secretary*—Joseph Chamberlain, 14 Calverley Park Gardens, Tunbridge Wells.

Tyneside Camera Club.—(ESTABLISHED 1891.)—Meetings held at 50 Waller Street, Byker, Newcastle-on-Tyne. *President*—J. Brown. *Secretary*—Joseph Fraser McKie, 50 Waller Street, Byker, Newcastle-upon-Tyne.

Ulster Amateur Photographic Society.—(ESTABLISHED 1885.)—Meetings are held at the Museum, College Square, Belfast. *President*—John J. Andrew, L.D.S., F.C.S. *Vice-Presidents*—John Brown, William Gray, M.R.I.A., W. Redfern Kelly, M.R.I.A., F.R.A.S., James Leslie, Professor Letts, Ph.D., F.R.S.E., F.C.S., Cecil F. Shaw, M.A., M.D., James Stelfox, Alexander Tate. *Committee*—Miss M. K. Andrews, A. H. M'Bride, F. J. Brill, John Woodside, J. H. Greenhill, M.Inst.E.E., Otto Jaffe, J.P, James M'Cleery, W. E. Williames. *Treasurer*—J. Campbell Carson. *Secretary*—James J. Hyde, Essex House, Strandtown, Belfast.

Uttoxeter Photographic Society.—(ESTABLISHED 1890.)—Meetings are held at Carter Street, Uttoxeter. *President*—Rev. C. F. Lowry Barnwell. *Vice-Presidents*—Hugo Meynell, F. Bolton, C. W. Lyon. *Committee*—S. Bamford, R. T. A. Hardy, H. Holmes, Hugo Meynell, A. Parker, C. J. Peto, C. Wallis. *Treasurer*—R. T. A. Hardy. *Secretary*—Rev. C. F. Lowry Barnwell, Stramshall Vicarage, Uttoxeter.

Vale of Llangollen Camera Club.—(ESTABLISHED 1893.)—Meetings held at Salop House. *President*—Ralph Darlington, F.R.G S. *Vice-Presidents*—J. M. Corney and Joseph Hall. *Committee*—Hiram Davies Sergeant Bagshaw, John H. Davies, Jonathan Edwards. *Treasurer*—Gomer Rowlands. *Secretary*—Herbert Victor Davies, Salop House, Llangollen.

Wakefield Photographic Society.—(ESTABLISHED 1891.)—Meetings held at the Church Institution, Westgate. *President*—W. T. Wilkinson. *Vice-Presidents*—Rev. Aspinall Addison and H. M. Briggs. *Committee*—A. W. Stansfield, J.P., Major Norwood, E. Miles, J. R. Shaw, J. H. Chaplain, W. Holmes, R. Robson. *Treasurer*—A. H. Roberts. *Secretary*—W. T. Wilkinson, 19 Queen Street, Wakefield.

Walsall Amateur Photographic Society.—(ESTABLISHED 1892.)—Meetings held at the Y.M.C.A., Walsall. *President*—John R. Cooper. *Committee*—W. H. Bullock, J. W. Carver, W. C. Checkley, B. Greatrex, W. A. Hubball, W. Meikle, S. A. Newman, F. Partridge, H. B. Smith. *Secretary and Treasurer*—E. A. Day, 14 Westbourne Road, Walsall.

Walthamstow Photographic Society.—(ESTABLISHED 1894.)—Meetings are held at Mission Cottage, Vestry Road, Walthamstow, on the first and third Mondays in each month (except Bank Holidays) at 8 p.m. *President*—W. A. Longmore. *Treasurer*—W. Houghton. *Committee*—J. G. Galliford, P. Johns, J. H. Shaw, T. R. Nunn, E. W. Appleton, C. S. Scott. *Hon. Secretary*—W. E. Lane, 24 Prospect Hill, Walthamstow.

Walton (Liverpool) Photographic Society.—(ESTABLISHED 1889.)—Meetings held at the Walton Church Schools, Liverpool. *President*—F. Murphy. *Council*—Jno. Kennedy, Henry Sharrock, H. T. Livesley, C. W. McKie, Jno. Parke, George Latimer. *Secretary and Treasurer*—T. Bickerstaff, 79 Rawcliffe Road, Walton, Liverpool.

Warrington Amateur Photographic Society.—(ESTABLISHED 1887.)—Meetings are held at the School of Science, Wilson Patten Street, Warrington. *President*—John Fairhurst. *Vice-Presidents*—H. N. Houghton and T. Hesketh. *Council*—C. B. Aylward, H. Bond, J. Critchley, R. Graham, J. Harding, G. Kirby, H. Milling, T. Welsby, J. Lyon Whittle, W. Winstanley. *Treasurer*—P. Dalton. *Secretary*—D. S. Stone, Crosfield Street, Warrington.

Waterloo (Liverpool) Social Camera Club.—(ESTABLISHED 1893.)—*President*—J. T. Norman Thomas. *Council*—The Officers, with E. Rawlins and C. W. Budden. *Treasurer*—J. E. Hume. *Secretary*—G. D. Dean, The Dunes, Blundellslands, Liverpool.

West London Photographic Society.—(ESTABLISHED 1888.)—Meetings are held at the Broadway Hall, Hammersmith. *President*—G. F. Blackmore. *Vice-Presidents*—L. Selby, J Wilson, W. A. Brown, C. Winter. *Council*—J. J. Adam, T. Coysh, J. E. Kellow, A. Beard, M. W. Cockerell, C. Dixon, W. Taylor. *Treasurer*—H. Selby. *Secretary*—Alfred Ebbs, 183 The Grove, Hammersmith, W.

West Surrey Photographic Society.—(ESTABLISHED 1887.)—Meetings held on Wednesdays at Stanley's Restaurant, Lavender Hill, Clapham Junction S.W. *Patron*—P. M. Thornton, M.P. *Hon. Members*—George Davison, B. Andrew Lillie, A. Maskell, J. Bond, Frank S. Murray. *President*—George H. James. *Vice-Presidents*—G. H. Seward, J. T. Price, J. Bulbeck. *Committee*—A. S. Angell, E. W Burch, W. J. Channon, A. W. Curtiss, J. B. Dixon, H. P. Hoad, E. Pointon. *Hon. Librarian*—S. Payton. *Hon. Secretary and Treasurer*—W. H. Wilshere, 236 Lavender Hill, Clapham Junction, S.W. *Hon. Assistant Secretary*—G. Bottle, 55 Lavender Sweep, S.W.

Weymouth and District Camera Club.—(ESTABLISHED 1895.)—Meetings held at the Oddfellows' Hall, Market Street, Weymouth. *President*—Colonel R. H. Palmer, R.A., M.R A.C. *Hon. Secretary*—Rev. E. C. Bennett, 10 Newberry Terrace, Weymouth.

Widnes Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Drill Hall, Widnes. *President*—V. C. Driffield. *Vice-President*—G. J. Warner. *Council*—J. S. Sinclair, A. J. Squires, W. Priestnall, J. Pilling, F. Brown. *Hon. Treasurer*—T. Cosier. *Hon. Secretary*—J. Newburn, 5 Beach Terrace, Widnes.

Wigan Photographic Society.—(ESTABLISHED 1890.)—Meetings held at the Quadrant Café, Rodney Street, Wigan. *President*—R. Wardman. *Vice-Presidents*—Rev. J. S. Barnes, G. R Newman, S. Richardson. *Council*—J. H. Atherton, B. B. Hartley, John Smith, H. S. Hill, P. Clark, W. E. Boyce, G. M. Martin *Secretary and Treasurer*—Frederick Betley, 10 Springfield Street, Wigan.

Windsor Amateur Photographic Research Camera Club.—(ESTABLISHED 1893.)—Meetings held at Montpelier House, or on invitation of some of the members. *President*—James Collins. *Vice-Presidents*—Sir David Taylor, J.P., and James Henderson, M.A., J.P. *Committee*—Sidney Greer, Joseph McConnell, John Thompson. *Treasurer*—Robert B. Gardner. *Secretary*—William James Gibson, Montpelier House, Belfast.

Wolverhampton Photographic Society.—(ESTABLISHED 1888.)—Meetings held at the Blind Institute, Victoria Street, Wolverhampton. *President*—J. M. Taylor. *Vice-President*—H. E. Perry. *Committee*—T. H. Cox, Dr. F. Dally, R. W. Deans, O. T. Hayward H. Holcroft, W. G Orme, F. White, F. H. Whitehouse. *Treasurer*—F. J. Gibson. *Secretary*—G. Hanmer, 2 Dudley Road, Wolverhampton.

Woolwich Photographic Society.—(ESTABLISHED 1892.)—Affiliated to the Royal Photographic Society. Meetings held at St. John's Schools, Wellington Street, Woolwich. *President*—W. H. Dawson. *Vice-Presidents*—Colonel C. D. Davies, H. H. Barker, C. Churchill. *Council*—W. E. Champion, J. Cregan, J. Desforges, W. R. Dunger, James Hope, H. J. Spencer, G. Tapp. *Secretary and Treasurer*—Frederick W. Machen, 161 Griffin Road, Plumstead, S.E.

Woodford Photographic Society.—(ESTABLISHED 1893.)—Meetings are held at the Coffee Tavern, George Lane, South Woodford. *President*—E. B. Caird. *Council*—Messrs. Goodwin, Malby, and Smith. *Secretary and Treasurer*—F. E. Emler, 1 Florence Villas, Chelmsford Road, Woodford.

Worcestershire Photographic Survey Society.—(ESTABLISHED 1896.)—Meetings held at the Victoria Institute, Worcester. *President*—J. W. Willis Bund. *Vice-Presidents*—Lord Cobham, the Hon. A. Percy Allsopp, Michael Tomkinson, George E. Abell, John Corbett, Frederick Corbett. *Council*—J. W. Willis Bund, F. Corbett, Ernest Day, W. A. Firkins, S. G. N. Spofforth, T. Duckworth, R. H. Murray, F. Ronald Jeffrey, C. R. Sayer, T. J. Hobson, Rev. W. M. Kingsmill, Rev. E. N. Dew, Captain Sherwell, F. E. Hill, J. B. Judson, J. Cane, W. L. Frost, J. F. Santonna, S. Hill, T. James, J. Page Croft. *Hon. Members*—W. A. Firkins and Alderman Ernest Day. *Hon. Auditor*—T. James. *Hon. Secretary and Treasurer*—S. G. Norcliffe Spofforth, 10 Pierpoint Street, Worcester.

Worcester Tricycle Club (Camera Section).—(ESTABLISHED 1892.)—Meetings held at the Bell Hotel, Worcester. *President*—J. Wilkes. *Committee*—J. Cam, W. Cam, S. Hill, T. James, J. F. Santonna. *Treasurer*—F. E. Hill. *Secretary*—T. J. Hobson, 15 Albany Terrace, Worcester.

Wycombe Camera Club.—(ESTABLISHED 1892.)—Meetings held at the South Bucks Auction Mart, Wycombe. *President*—W. Howland. *Committee*—Messrs. Broughton, Turner, Norton, Sherriff, Burton, Fox. *Secretary and Treasurer*—J. Wilford, 7 High Street, High Wycombe.

Yeadon and District Photographic Society.—(ESTABLISHED 1896.)—Meetings held at the Town Hall, Yeadon. *President*—E. E. Slater. *Vice-Presidents*—H. E. Illingworth and B. Town. *Committee*—R. P. Jibson, T. A. Womersley, T. Lumb, T. Wormald, R. L. Hardcastle. *Secretary and Treasurer*—E. Lamb, Moorfield Terrace, Yeadon, near Leeds.

Y.M.C.A. Camera Club.—(ESTABLISHED 1894.)—Meetings are held at the Y.M.C.A. Rooms, Friar Street, Reading. *Secretary*—J. W. Kent, 131 Friar Street, Reading.

York Photographic Society.—(ESTABLISHED 1887.)—Meetings are held at the Victoria Hall, York. *President*—Thomas Brown. *Vice-President*—Thomas Hunter. *Council*—R. Redpath, G. F. Dawson, J. Dickinson, F. Shrœder. *Treasurer*—R. Bainbridge. *Secretary*—Frederic G. P. Benson, 50 Scott Street, York.

Yorkshire Philosophical Society (Photographic Section).—(ESTABLISHED 1888.) — Meetings are held on first Wednesday at the Museum, York. *President*—Tempest Anderson, M.D., J.P., B.Sc. *Vice-Presidents*—William Monkhouse and John Kitching. *Committee*—A. Tempest, Malcolm Spence, George Baker, B. Wales. *Secretary and Treasurer*—H. Dennis Taylor, F.R.A.S., Trenfield, Holgate, York.

COLONIAL PHOTOGRAPHIC SOCIETIES.

Amateur Photographic Association of Victoria, Melbourne.—(Established 1883.)—Meets monthly on the second Tuesday in each month, Informal Meetings on the fourth Monday in the month, at the Royal Society's Hall, Victoria Street, Melbourne. *President*—Dr. Kaufmann. *Hon. Secretary*—J. H. Harvey.

Amateur Photographic Society of Madras.—(Established 1888.)—Meetings held at the Masonic Hall, Madras. *Patrons*—H.E. Sir Arthur Elibank Havelock, G.C.M.G., G.C.I.E., and the Hon. the Maharajah of Vizianagram, G.C.I.E. *President*—C. Michie Smith, B.Sc. *Vice-Presidents*—W. A. Willock, I.C.S., and Surgeon-Major J. L. Van Geyzel. *Committee*—Mrs. McNair, R. Ll. Jones, A. E. Lawson, W. H. Oakes, C. E. Phipps, E. W. Stoney. *Treasurer*—V. G. Lynn. *Secretary*—S. Jackson, F.I.C., c/o Messrs. Binny & Co., Madras.

Auckland Photographic Club, New Zealand.—General Meetings, the second and fourth Thursday of each month. Annual Meeting in October. Club Rooms, Australian Mutual Provident Society's Buildings, Queen Street, Auckland. *Hon. Secretary*—G. R. Boulton.

Ballarat Photographic Club, Ballarat, Victoria.—Meetings are held on the fourth Wednesday in each month in the School of Mines, Ballarat. *Hon. Secretary*—Frederick D. Martell.

Barossa Camera Club, Nuriootpa, South Australia.—*Hon. Secretary*—Walter J. Ponder.

Bendigo Amateur Photographic Society.—Meetings held at the School of Mines. *President*—J. W. Faul. *Hon. Secretary*—F. Napoli Prescott.

Canterbury Philosophical Institute (Photographic Section), Christchurch, New Zealand.—Meetings held on second Tuesday in each month. *Hon. Secretaries*—S. Page and R. C. Bishop.

Cape Town Photographic Club.—(Established 1890.)—Meetings are held at the Y.M.C.A. Hall, Cape Town. *President*—David Gill, LL.D., F.R.S., &c. *Vice-President*—Professor W. S. Loyeman. *Council*—D. C. Andrew T. W. Cairncross, J. P. Edwards, A. Gracie, R. T. Pett, E. J. Steer, J. R. Wignall, C. Ray Woods. *Secretary and Treasurer*—Andrew James Fuller, 37 Grave Street.

Central Queensland Amateur Photographic Club, Rockhampton.—*Hon. Secretary*—H. V. Sankey.

Dunedin Photographic Society, Dunedin New Zealand.—Meetings held every Wednesday in Club Rooms, Liverpool Street. *Hon. Secretary*—P. Helmore.

Foochow Camera Club.—(Established 1892.)—Meetings held at the Club Rooms. *President*—G. Siemssen. *Vice-President*—F. J. Rentzsch. *Hon. Treasurer*—H. W. Churchill. *Hon. Secretary*—J. Mencarini, Foochow, China.

Gordon College Amateur Photographic Association.—(Established 1889.)—Meetings held on each Friday in the month at Gordon College, Geelong, Victoria. *President*—H. G. Roebuck. *Vice-Presidents*—S. R. J. Mawson and J. H. McPhillimy. *Committee*—A. E. Bratley, G. Brinsmead, C. O. Dentry, J. B. Leitch, A. Purnell. *Treasurer*—R. Collins Hocking. *Hon. Secretary*—John Hammerton, jun., 73 Little Ryrie Street, Geelong, Victoria.

Hamilton Association Camera Club.—(Established 1892.)—Headquarters, Museum, Main Street, West. Annual meeting, April. Meetings, last Tuesday of each month. *Secretary and Treasurer*—Wm. White, 9 James Street, North, Hamilton, Ontario, Canada.

Hawke's Bay Camera Club, Napier, New Zealand.—*Secretary*—W. Beswick, Post Office, Napier.

Ipswich and West Moreton Amateur Photographic Society, Ipswich, Queensland—(Established 1893.)—Meetings on the second Wednesday of each month. *Hon. Secretary*—E. Bostock, Brisbane Street, Ipswich, Queensland, Australia.

Kimberley Camera Club.—(Established 1890.)—Meetings held at the Club Rooms. *President*—James Lawrence, M.L.A. *Chairman*—Montague Thane. *Vice-Chairman*—F. H. Hancox. *Council*—J. Childs, E. Goffe, L. Atkinson. *Secretary and Treasurer*—Charles Howie, P.O. Box 233, Kimberley, S.A.

Melbourne Working Men's College Photographic Society, Melbourne, Victoria.—Meetings held on the first Tuesday in each month at Latrobe Street. *President*—Professor Kernot. *Hon. Secretary*—Mr. Relph.

Montreal Camera Club.—(Established 1890. Incorporated 1892.)—Place of Meeting, 4 Phillips Square, Montreal. Annual Meeting, first Tuesday in May. Regular Meetings, first and third Tuesdays from October to May inclusive. *President*—Edward Stanger. *Vice-President*—A. J. Ferguson. *Committee*—George Sumner, Howard T. Barnes, Frank R. Redpath, Charles Lester, George McDougall, Nevill Norton Evans. *Treasurer*—A. Clarence Lyman. *Secretary*—Alfred W. Cole, 28 Victoria Street, Montreal, Canada.

Nelson Camera Club, Nelson, New Zealand.—Meetings are held on the third Friday of each month at the Club Rooms, Hartley Street. *Hon. Secretary*—H. Brusewitz.

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Northern Tasmania Camera Club, Launceston.—(Established 1889.)—Meetings held on the third Wednesday of each month. *Hon. President*—W. H. Twelvetrees. *Vice-Presidents*—P. C. Maxwell, J. Sparrow, Charles Hart. *Committee*—R. Lewis Parker, F. C. Birchall, J. A. Larner. *Hon. Secretary and Treasurer*—F. Styant Browne, 112 Brisbane Street, Launceston.

N.S.W. Lands Department Photographic Society, Sydney.—Meetings held on the last Thursday in each month. *Chairman*—J. R. Yorke. *Committee*—O. W. Ballhausen, E. T. Davis, M. V. Murphy, H. P. Rich, R. W. Vale. *Hon. Secretary and Treasurer*—William Hamilton, Lands Department, Sydney.

N.S.W. Railway and Tramway Camera Club, Sydney.—Meetings held on the first Monday in each month. *Hon. Secretary*—J. Scoular.

Perak Amateur Photographic Society.—(Established 1895.)—Meetings are held in the Society Room every first Wednesday of the month. *President*—L. Wray, jun., F.Z.S., M.I.E.E. *Committee*—M. J. Wright, M.B., C.M., R. O. N. Anderson, A.M.I.C.E., F. Duberly, W. van Dart. *Hon. Secretary*—George Bain.

Photographic Association of Canada.—(Established 1883.)—Place of Meeting, London, Ontario, Canada. *President*—H. S. Park (Toronto). *First Vice-President*—J. Frank Jackson (Barrie). *Second Vice-President*—W. Still (Orangeville). *Treasurer*—J. T. Ramsay (Toronto). *Secretary*—Thomas D. Hastings, c/o Frank Cooper, London, Ontario, Canada.

Photographic Society of India.—(Established 1888.)—Meetings are held at 57 Park Street, Calcutta. *Patron*—His Excellency the Earl of Elgin. *Patroness*—Lady Mackenzie. *President*—P. Donaldson. *Vice-Presidents*—N. Giannacopulo and T. A. Pope. *Committee*—Arthur Caspersz, W. R. Donogh, T. C. Downing, E. B. Havell, A. Thomson, E. M. Showers, Maharaj Kumar P. K. Tagore, A. Tocher, T. H. Wilson. *Hon. Treasurer*—T. N. Maniachi. *Hon. Secretary*—H. N. Harris, 57 Park Street, Calcutta.

Photographic Society of Japan.—(Established 1889.)—*President*—Viscount Enomoto, Minister of Education for Japan. *Vice-Presidents*—Professor D. Kikuchi, M.A. (Cantab.), Dr. W. S. Bigelow, Kajima Seibei, Dr. E. Baelz. *Treasurer*—Y. Ishizu. *Secretaries*—Professor H. Ishikawa and Professor W. K. Burton.

Photographic Society of New South Wales, Sydney.—Meetings held every Tuesday at the Society's Room, Hamilton Street. *Hon. Secretary*—E. T. Davis, Box 829, G.P.O.

Photographic Union of New South Wales, Sydney.—Meetings held on the first Thursday of each month. *Hon. Secretary*—Charles H. Kerry.

Queensland Amateur Photographic Society, Brisbane.—(Established 1887.)—Meetings are held on the fifteenth of each month at *Courier* Buildings, Brisbane. *Hon. Secretary*—J. F. Campbell.

Singapore Amateur Photographic Society.—Meetings are held at 53 Hill Street, Singapore. *President*—E. J. Nanson. *Committee*—A. W. Bean and G. Brinkworth. *Treasurer*—F. M. Elliot. *Secretary*—E. F. Gros, Singapore.

Southland Camera Club, Invercargil, New Zealand.—Meetings held on the third Monday in each month. *Hon. Secretary*—A. M. Macdonald, Esk Stores.

St. John Camera Club.—(ESTABLISHED 1893.)—Meetings held at 65 William Street, St. John, New Brunswick. *Secretary*—J. Kaye-Allison, P.O. Box 401, St. John, N.B. Canada.

South Australian Photographic Society.—(ESTABLISHED 1885.)—Meetings held at the Chamber of Manufactures, North Terrace, Adelaide. *Patrons* Hon. Sir E. T. Smith, K.C.M.G., M.L.C., Sir Charles Todd, K.C.M.G., Hon. Dr. J. A. Cockburn, M.P., Professor E. H. Rennie, M.A., D.Sc., Professor W. H. Bragg, M.A., J. J. Green. *Past Presidents*—S. J. Dailey, C. F. Clough, G. Stace, E. W. Belcher. *President*—A. W. Dobbie. *Vice-Presidents*—C. L. Whitham and R. F. Griffiths. *Committee*—The Executive Officers, A. W. Marshall, A. H. Kingsborough, C. E. Kerr. *Auditors*—C. Radcliffe and J. D. Dixon. *Hon. Librarian and Assistant Secretary*—G. Hassell. *Hon. Treasurer*—S. P. Bond. *Hon. Secretary*—J. Gazard, Mutual Chambers, 111 King William Street.

Toronto Camera Club.—(ESTABLISHED 1885, INCORPORATED 1893.)—Place of Meeting, the Forum Building, corner of Yonge and Gerrard Streets, Toronto, Ontario, Canada. *President*—Edmund E. King, M.D. *First Vice-President*—W. B. Varley. *Second Vice-President*—F. D. Manchee. *Committee*—E. M. Lake, W. H. Moss, Hugh Neilson, J. G. Ramsey, T. D. Bailey, H. M. R. Glover. *Secretary and Treasurer*—John J. Woolnough, 94 McPherson Avenue, Toronto, Ontario, Canada.

Upper Canada College Camera Club.—(ESTABLISHED 1891.)—Meetings are held at Upper Canada College, Toronto, Ontario, Canada. *Secretary*—O. M. Biggar, 249 Simcoe Street, Toronto, Ontario, Canada.

Wanganui Camera Club, New Zealand.—*President*—A. Elliott. *Hon. Secretary*—D. Meldrum.

Wellington Camera Club, New Zealand.—(ESTABLISHED 1892.)—Meetings are held on the second Friday in each month in the Fine Art Gallery, Whitmore Street. *Hon. Secretary*—F. J. Denton, 33 Willis Street.

West Australian Photographic Society, Perth.—(ESTABLISHED 1894.)—Meetings held on the third Wednesday in each month. Annual meeting in September. *Hon. Secretary*—A. R. L. Wright, Public Works Department, Perth.

Westland Camera Club, Hokitika, New Zealand.—*President*—James Park. *Hon. Secretary*—James King.

CONTINENTAL PHOTOGRAPHIC SOCIETIES.

Amateur Fotografen-Vereeniging te Amsterdam. Established September 1, 1887. Headquarters and Studio, Handboogstraat 2. Meetings, Wednesday, fortnightly. Ign. Bispinck, President. W. H. de Witt, Librarian. J. P. Goedkoop, Commissary. A. W. de Flines, Treasurer. D. Wilmerink, Handboogstraat 2, Secretary.

Association Belge de Photographie.—Established May 17, 1874. Meetings are held at the Palais du Midi, Bruxelles. Seven Sections: Brussels, Antwerp, Ghent, Courtrai, Louvain, Liège, Namur. S.A.R. Monseigneur le Prince Albert de Belgique, Hon. President. Jos. Casier, President. Jos. Maes and Massange de Louvrex, Vice-Presidents. — Canfyn, A. de Gryse, B. de Vaux, E. Jossart, Alb. Lunden, A. Nyst, E. Orban-Viot, H. Peltzer, Ch. Puttemans, A. Rutot, J. Savoné, V. Selb, and — Stappers, Committee. A. Nyst, Treasurer. Marcel Vanderkindere, 97 Avenue Brugmann, Uccle lez-Bruxelles, Secretary.

Association Nationale des Photographes Amateurs.—Fondée le 15 Mars, 1894, et autorisée par arrêté préfectoral du 22 Décembre, 1894. Place of Meeting, au domicile du Président, actuellement à Châteaugiron (Ille-et-Vilaine). Alfred Savary, President. M. Jousseaume, Vice-President. MM. Cosnard, Le Sage de la Haye, Marnelle, and Le Millier, Committee. Roul de la Hellière, au Château de Châteaugiron (Ille-et-Vilaine), Secretary and Treasurer.

Dansk Fotografisk Forening.—Established April 5, 1879. Place of Meeting, Copenhagen. F. C. L. Weller, President. P. Fristrup, Vice-President. C. U. Bauer, Treasurer. P. Schaumburg, Nórrebrogade 12, Copenhagen N., Secretary.

Deutsche Gesellschaft von Freunden der Photographie in Berlin.—Meldungen zum Beitritt für die Deutsche Gesellschaft von Freunden der Photographie nehmen die Mitglieder des Vorstandes entgegen und versenden dieselben auf Wunsch die 'Satzungen' der Gesellschaft. Näheres durch den Schriftführen Herrn Direktor Schultz-Hencke, Lette-Institut, Berlin S.W., Königgrätzer-strasse 90. Der Jahresbeitrag beträgt M.20,00. für Auswärtige jährlich M.14.

Deutscher Photographen Verein.—Established December 29, 1876. Place of Meeting, Weimar, every year in August, K. Schwier, President. Karl Wunder, Vice-President. George Alpers, jun., F. Dyck, and Ernst Sonntag, Committee. K. Schwier, Treasurer. C. Kesselhuth, Hildesheim, and K. Schwier, Weimar, Secretaries.

Fachverein der Photographen zu Berlin.—Established December 1, 1893. Place of Meeting, Berlin, S. 14, Neue Ross-str., 3. Israr Brettschneider, President. Paul Tarksteit, Vice-President. Eduard Günther, Treasurer. R. Obizh and Eduard Günther, N.W. Lessingstrasse, 18, Secretaries.

Gröninger Amateur Photographen Vereeniging 'Daguerre.'—Established 1891. Meetings held at the Hotel Willems. R. Roelfsema, President. H. W. Freseman Vietar, Vice-President. C. A. M. van Riet, Treasurer. Thr. O. T. Quintus, Oosterstraat Groningen, Secretary.

Haarlemsche Amateur Fotografen Club.—Established 1891. Place of Meeting, Haarlem Societeit Vereeniging. F. J. M. Huijsser, President. C. G. H. Bakker, Treasurer. Maurits H. Binger, Zylweg, 55, Haarlem, Secretary.

Le Photo Velo Club de Paris.—M. Violette, 21 Boulevard St. Germain, Paris, France, Secretary.

Münchener Photographische Gesellschaft.—Established 1879. Place of Meeting, München. Adalbert Werner, President. Otto Wernhard, Treasurer. E. Kieser, Secretary. Address of Society, Deutsches Haus, Carlsplatz, München.

Nederlandsche Vereeniging van Dilettant Photographen 'Helios.'—Established, 1872. Meetings held at the Photographic Studio and Club Rooms of the Society, Spui, Amsterdam. J. Praetorius, President. J. J. Uytwerf Sterling, Joh. Ruys, F. W. Oewel, Committee. G. van der Aa, Treasurer. W. K. W. Matthes, Willemsparkweg 35, Amsterdam, Secretary.

CONTINENTAL PHOTOGRAPHIC SOCIETIES—*Continued.*

PHOTOGRAPHISCHE GESELLSCHAFT, HAMBURG, ALTONA.—Established November 4th, 1873. G. Wolf, Hamburg, President. Th. Petersen, St. Pauli, Vice-President. Herm. Boock, C. W. Lüders, Kunstschleifer, Committee. W. Köhnen, Altona, Treasurer. H. Boock, Bergstrasse, 26. Meets first Tuesday in the month, at 8 p.m., at Gerhafstrasse, 10, Hamburg.

PHOTOGRAPHISCHE GESELLSCHAFT IN WIEN.—Established 1861. Place of Meeting, Palais der Akademie der Wissenschaft, Wien. Ottomar Volkmer, President. Dr. Carl Böhm von Böhmersheim, Vice-President. Carl Angerer, Wilhelm Burger, Josef Maria Eder, Michael Frankenstein, J. Löwy, Wilhelm Müller, Wilhelm Freiher von Schwarz-Senborn, Robert Sieger, Josef Ungar, and Louis Zwickl, Committee. Ludwig Schrank, Treasurer. Dr. Josef Székely, Secretary, Wien I. Elisabethstrasse, 2.

PHOTO-CLUB DE PARIS.—Established 1888. Place of Meeting, 44 Rue des Mathurins, Paris. Maurice Bucquet, President. E. Mathieu, Vice-President. M. Brémard, R. Demachy, P. Gers, M. Binder, C. Puyo, A. Darnis, and A. Toutain, Committee. H. Guérin, Treasurer. Paul Bourgeois, 44 Rue des Mathurins, Paris, Secretary.

PHOTOGRAPHISCHER VEREIN ZU BERLIN.—Established 1863. Place of Meeting, Berlin, Architecten Vereinshaus. Paul Grundner, President. T Reichard, Vice-President. T. C. Schaarwächter, Dr. S. Steinschneider, Paul Schückert, Hpsm. u. Dr. Himly, Dr. A. Miethe, Dr. A. Hesekiel, and F. Cornand, Committee. E. Martini, Treasurer. Director Schultz-Hencke, Berlin, S W. Königgratzerstrasse, P.V., Secretary.

SOCIÉTÉ FRANÇAISE DE PHOTOGRAPHIE.—Established 1854. Place of Meeting, 76 Rue des Petits-Champs, Paris. M. Lippmann, President. M. Davanne, Vice-President. MM. Davanne (President), Le Général Sebert and Bardy (Vice-Présidents), Perrot de Chaumeux (Secrétaire Général), Pector and Londe (Secrétaires Généraux adjoints), Audra (Trésorier), Bordet (Bibliothécaire), Gauthier Villars, Gobert, Rolland, De Saint-Senoch, Thouronde, and De Villecholle, Council. MM. Aimé Girard and Gauthier Villars, père, Hon. Members. M. Audra, Treasurer. M. Perrot de Chaumeux, 1 Rue Malleville, Enghien-les-Bains (S. & O.), Secretary.

SOCIÉTÉ GENEVOISE DE PHOTOGRAPHIE.—Established 1882. Meetings held at the Society's Rooms, 1 Grand Mézel. Dr. E. Batault, President. MM. Lacombe and Mazel, Vice-Presidents. J. A. Bouvier, Librarian. L. Jaquerod, Treasurer. MM. John Bosson, Rue Thalberg, 4, and Blachier, Tranchées de Rive, 11, Secretaries.

SOCIÉTÉ NANTAISE DE PHOTOGRAPHIE.—Established 1881. M. du Hanlay, Lieut.-Colonel, President. M. Toublanc, Vice-President. Ch. Planté, H. Bureau, P. du Minchy, Committee. M. Tassain, Treasurer. Paul Crémant, Rue d'Alger, 13, Nantes, Secretary, and Pierre Courant, Assistant Secretary. Réunion le premier vendredi de chaque mois, au Cercle des Beaux-Arts.

SOCIÉTÉ PHOTOGRAPHIQUE PROFESSIONNELLE.—Established 1878. Place of Meeting, Place St. Gervais, 6, à Genève. E. Dovaz, President. Charles Racine, Vice-President. Louis Barral, Treasurer. Antoine Chevalley, Siège de la Société, Secretary.

SOCIÉTÉ VERSAILLAISE DE PHOTOGRAPHIE.—Established 1884. Séances de la Société les premiers Mardis de chaque mois à la Mairie à 8 heures et demie du soir. Maurice Bucquet, President. L. Ottenheim, Vice-President. Comité d'administration, Committee. M. Gavin, Treasurer. Jessé Curely, 20 Rue de Provence, Versailles, Secretary.

VEREIN ZUR FÖRDERUNG DER PHOTOGRAPHIE.—Established 1869. Professor O. Raschdorff, President. Professor Dr. H. W. Vogel, Ehren-President. Dr. E. Vogel, H. Haberlandt, W. Dioskau, E. Fuchs, A. Herzheim, P. Loescher, H. Schmidt, F. Staudigl, and Dr. Stockner, Committee. Gustav Schmidt, Treasurer. Paul Hanncke, Berlin, W., Bülowstrasse, 99, Secretary.

VEREIN ZUR PFLEGE DER PHOTOGRAPHIE UND VERWANDTER KÜNSTE, FRANKFURT A. MAIN.—Established 1875. Docent am der technischen Hochschule, F. Schmidt, President. H. Maas, Vice-President. T. H. Voigt, C. Ruf, W. Pöllot, Dr. C. Kleinschmidt, and J. E. Rumpel, Committee. C. Böttscher, Treasurer. Dr. A. Shebel, Protocoll Secretary. Th. Haake, Frankfurt a. Main, Correspondenz Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES.

Agassiz Association, Manhattan Chapter (*Photographic Section*), *New York.*—Established 1881. Meetings held at 141 East Fortieth Street, New York City. C. F. Groth, President. C. Kromm, Vice-President. C. F. Groth, R. Kitchelt, E. B. Miller, W. S. Miller, H. T. Rowley, H. Brennich, F. C. Fruhan, Miss M. Leeson, and Miss M. Hargrove, Committee. W. S. Miller, Treasurer. E. B. Miller, 141 East Fortieth Street, New York City, Corresponding Secretary.

Akron Camera Club.—Meetings are held at residences of members on the second Tuesday of each month. Edward A. Terrass, President. Henry Canfield, Vice-President. Frank Adams, Treasurer. Margaret Mitchell, 150 South Summit Street, Akron, Ohio, U.S.A., Secretary.

Albany Camera Club.—Organized October 21, 1887. Meetings held at the Club House, 72 Chapel Street, Albany, N.Y. W. W. Byington, President. Dr. L. H. Neuman, Vice-President. Dr. S. B. Ward, Prof. Maurice Perkins, John S. Paterson, Geroge H. Russell, C. W. Reynolds, Dr. Frank W. Cady, Dr. C. S. Moore, and L. H. Stewart, Directors. Edward D. Mix, Treasurer. Charles B. Tillinghast, 72 Chapel Street, Albany, N.Y., Secretary.

Amateur Photographic Association (*Selma, Alabama*).—Established Dec. 29, 1887. Meetings held at 916 Broad Street, Selma, Alabama. William S. Monk, President. S. A. Sexton and Miss Mary E. Keipp, Committee. S. Orlando Trippe, Selma, Dallas County, Alabama, Secretary and Treasurer.

American Institute (*Photographical Section.*)—Established 1859. Regular Meetings are held on the first Tuesday in each month, at Eight p.m., except July, August, and September, at 111, 113, 115 West Thirty-eighth Street, New York City. Oscar G. Mason, President. R. A. B. Dayton, Vice-President. Committee on Chemistry and Optics, Committee. William H. Oakley, Treasurer. Dr. John W. Bartlett, 149 West Ninety-fourth Street, New York City, Secretary.

American Lantern Slide Interchange.—Established 1885. Incorporated 1893. Meetings held at 361 Broadway, New York, on November 15 of each year. F. C. Beach, W. H. Rau, William H. Olmsted, W. H. Cheney, and John S. Paterson, Board of Managers. F. C. Beach, 361 Broadway, New York, General Manager and Secretary. William H. Olmstead, Syracuse, N.Y., and W. H. Rau, Philadelphia, Pa., Assistant Managers.

Bethlehem Photographic Society.—Established January, 1894. Meetings held at Bethlehem, Pa., U.S.A. Professor E. M. Hyde, President. Professor H. S. Housekeeper, Vice-President. C. S. Smith, Treasurer. F. E. Hausmann, Bethlehem, Pa., U.S.A, Secretary.

Boston Camera Club.—Established 1881. Meetings held at the Club Rooms, 50 Bromfield Street, Boston, Mass. Joseph Prince Loud, President. William O. Witherell, Francis H. Manning, and Charles H. Currier, Vice-Presidents. Joseph Prince Loud, William O. Witherell, Francis H. Manning, Charles H. Currier, Charles Hall Perry, Charles H. Chandler, F. Alcott Pratt, Edward R. Andrews, Charles Sprague, Rufus A. Bullock, Horace Packard, Thomas J. Babcock, and Fred S. Harlow, Executive Committee. Charles H. Chandler, Treasurer. Charles Hall Perry, 50 Bromfield Street, Boston, Mass., U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Bridgeton Camera Society.—Established January, 1890. Incorporated March, 1893. Meetings held at 48–50 East Commerce Street, Bridgeton, N.J. Henry A. Janvier, President. George Hampton, Vice-President. Hugh L. Reeves, Howard W. Fithion, and Sydney E. Bower, Managing Committee. Sydney E. Bower, Treasurer. Henry W. Scull, Cumberland National Bank, Bridgeton, N.J., Secretary.

Brooklyn Institute of Arts and Sciences (*Department of Photography*).—Established 1887. Meetings held at 201 Montague Street. J. Frederick Hopkins, President. Myers R. Jones and George W. Wundram, Vice-Presidents. J. Frederick Hopkins, George W. Wundram, Professor William C. Peckham, William J. Bryant, Myers R. Jones, Henry L. Underhill, Mrs. C. H. Burdett, James W. Kent, L. D. Martens, Frank A. Perret, and James H. Ferguson, Executive Committee. L. D. Martens, Treasurer. W. J. Bryant, Box 53, Brooklyn, New York, U.S.A., Secretary.

Brooklyn (*N.Y.*) *Academy of Photography.*—Incorporated in February, 1887. Meetings held at 177 Montague Street, Brooklyn, New York, U.S.A. H. B. Fullerton, President. Samuel Baron and F. M. Lawrence, Vice-Presidents. Dr. John Merritt, Frank La Manna, William B. Dudley, A. R. Pardington, and Starks W. Lewis, Committee. A. F. Ormsbee, Curator and Librarian. William T. Wintringham, Treasurer. William Arnold, 177 Montague Street, Brooklyn, New York, U.S.A., Secretary.

Buffalo (*N.Y.*) *Camera Club.*—Established October 10, 1888. Meetings are held at Market Arcade, Main Street, Buffalo, N.Y. John A. Stein, President. Conrad L. Baer, Vice-President. John P. Zenner, 932 Genesee Street, Buffalo, N.Y., U.S.A., Secretary and Treasurer.

California Camera Club.—Incorporated April 5, 1890. Meetings held at 819 Market Street, San Francisco, California. W. B. Webster, President. W. E. Goodrum and E. W. Jensen, Vice-Presidents. C. A. Lee, J. J. B. Argenti, C. F. Cormack, E. J. Dollard, and P. Maunder, Directors. E. G. Eisen, Treasurer. H. B. Hosmer, 819 Market Street, San Francisco, California, U.S.A., Secretary. A. L. Coombs, 819 Market Street, San Francisco, California, U.S.A., Corresponding Secretary.

Camera Club, New York.—Established 1884. Meetings held at 111–113 West Thirty-eighth Street, New York City. William D. Murphy, President. Alfred Stieglitz, Vice-President. Louis B. Schram, William Bunker, William R. Thomas, John Beeby, James T. Vredenburgh, Committe. Frank M. Hale, Treasurer. Harry B. Reid, 111 West Thirty-eighth Street, New York City, Secretary.

Camera Club of Mount Vernon.—Established 1895. Meetings are held at Studio of W. F. Slaight, Fourth Avenue, Mount Vernon, New York, U.S.A. Miss Mary E. Jennings, Secretary.

Camera Club of the Capital Bicycle Club.—Established 1891. Meetings held at 409 Fifteenth Street, Washington, D.C., U.S.A. Charles Richards Dodge, President. E. Lee Ferguson, 1338 West Street, N.W., Washington, D.C., Secretary and Treasurer.

Camera Club of the University of Nebraska.—Established 1892. Meetings held at the Chemical Laboratory of the University of Nebraska, corner of Twelfth and R Streets, Lincoln, Neb., U.S.A. Miss Adaline Quaintance, P. O. Box 675, Lincoln, Neb., U.S.A., Secretary and Treasurer.

American Photographic Societies—*Continued.*

Camera Club of the University of Pennsylvania.—Established 1889. Meetings held at the College Hall, University of Pennsylvania, Thirty-sixth Street and Woodland Avenue, Philadelphia, Pa. Chas. R. Hinchman, 3655 Chestnut Street, Philadelphia, Pa., U.S.A., Secretary.

Camerads of New Brunswick, N.J.—Established 1882. Meetings held in Rutger's College. Peter T. Austin, Ph.D., President. William D. Horn, Vice-President. George Parsell, J. Arthur Blish, and Frederick Ulrich, Council. Charles V. Myers, Treasurer. Dr. Harvey Iredell, Lock Box 34, New Brunswick, N.J., U.S.A., Secretary.

Central Camera Club, Brooklyn Y.M.C.A.—Established June 1, 1888. Meetings held at 502 Fulton Street, Brooklyn, N.Y. William H. Lowery, President. James P. Allen, Vice-President. J. G. McTaggart, Treasurer. Edward L. Damon, 322 Livingston Street, Brooklyn, N.Y., U.S.A., Secretary.

Chautauqua Photographic Exchange Club.—Established 1888. C. M. Fitzgerald (Georgetown, California), President. Miss C. L. Pierce, Elmhurst, Riverside, Conn., U.S.A., Secretary and Treasurer.

Chicago Camera Club.—Established 1888. Meetings are held at 184 Wabash Avenue on the second Tuesday of each month at Eight o'clock. Annual Meeting in April. Rooms always open and in charge of competent attendant. Members of other societies from all parts of the world always welcome, and dark rooms and studio (completely equipped) at their disposal. M. L. Williston, D.Sc., President. M. R. Brown, M.D., and Mrs. N. Gray Bartlett, Vice-Presidents. T. B. Patterson, Treasurer. W. W. Abbott, Secretary.

Chicago Society of Amateur Photographers.—Established 1886. Meetings held at Noonday Rest, 4 East Monroe Street. Walter A. Morse, President. Marshall Waite, Treasurer. F. F. Gayford, 597 Cleveland Avenue, Chicago, Ill., U.S.A., Secretary.

Cleveland (Ohio) Camera Club.—Established January 25, 1887. Meetings held at 5 Euclid Avenue on the first and third Tuesday evenings of each month at Eight p.m. The Annual Meeting is held on the first Tuesday evening in January, unless that Tuesday is the 1st of January, in which case it is deferred until the third Tuesday. William Ogler, President. Charles Potter, Vice-President. William Dorn, Treasurer. R. Dayton, M.D., 1202 Willson Avenue, Cleveland, Ohio, U.S.A., Secretary.

Colorado Camera Club Association.—Incorporated January, 1891. Meetings held at the Club Rooms, 329 Sixteenth Street, Denver, Col. W. H. Jackson, President. H. H. Buckwalter, Vice-President. W. H. Jackson, H. H. Buckwalter, A. D. Gilleland, H. D. Smith, S. C. McCurdy, J. P. Brockway, William Ferris, jun., Board of Directors. H. D. Smith, Treasurer. A. D. Gilleland, 329 Sixteenth Street, Denver, Col., U.S.A., Secretary.

Columbia Camera Club of Astoria.—Established 1893. Meetings are held at Engine Company's Hall on the second Wednesday of each month. W. Timson, 598 Commercial Street, Astoria, Ore., U.S.A., Secretary.

Columbia College (N. Y.) Amateur Photographic Society.—Established 1886. Meetings at Columbia College twice a month. Henry R. Taylor, President. Dwight Taylor, Treasurer. H. M. Brookfield, Secretary.

Columbian College (Washington, D.C.) Camera Club.—Established 1888. Ordinary Meetings at Columbian College, Washington, D. C., every Wednesday afternoon. Allan J. Houghton, President. Edwin W. Ashford, Vice-President. W. B. Asmussen, Librarian. A. J. Houghton, Treasurer. Charles P. Spooner, Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Columbia Photographic Society.—Organized December 7, 1889. Incorporated 1894. Meetings are held at 1507 Columbia Ave., Philadelphia, Pa., U.S.A. Dr. G. J. R. Miller, President. W. P. Buchanan, Vice-President. Dr. G. J. R. Miller, W. P. Buchanan, John N. Reeve, Benjamin L. Berry, H. E. Havens, Charles J. Cole, and Rudolph Pott, Board of Directors. John N. Reeve, 203 Walnut Place, Room 4, Philadelphia, Pa., Secretary and Treasurer.

Columbus (Ohio) Camera Club.—Established October 6, 1884. Rooms, Y.M.C.A. Building. Regular Meetings, third Thursday of each month except July and August at half-past Seven p.m. Annual Meeting, third Thursday of December. John Field, President. C. H. Doty, Vice-President. C. S. Bradley, Treasurer. W. B. Kimball, 32 East Spring Street, Columbus, Ohio, U.S.A., Secretary.

Cortland Camera Club.—Established 1895. Meetings held at Y.M.C.A. Rooms. L. M. Alexander, Lock Box 213, Cortland, N.Y., U.S.A., Secretary and Treasurer.

Daguerre Camera Club.—Established 1886. Meetings held at Oak Park, Illinois. F. D. Blish, President. Wells B. Sizer, Oak Park, Ill., Secretary and Treasurer.

Delaware Camera Club.—Established 1891. Headquarters in its Club Rooms in the Equitable Building, Wilmington, Delaware. Regular Meetings are held on the first Thursday of each month. John M. Rogers, President. Miss Rachel S. Howland and Geo. A. Elliott, Vice-Presidents. John C. Phillips, 803 Franklin Street, Wilmington, Del., U.S.A., Secretary.

Detroit Lantern Club.—Established January, 1891. Meetings held at the Museum of Art, Hastings Street and Jefferson Avenue, Detroit, Mich. Frank E. Kirby, President. A. D. Noble, jun., Director. D. Farrand Henry, 52 Woodward Avenue, Detroit, Mich., U.S.A., Secretary and Treasurer.

Elizabeth Camera Club.—Established 1893. Meetings held at 96 Broad Street. Jas. A. Knowles, President. A. P. Campbell, Vice-President. Dr. E. D. Frost, T. F. McCarty, J. G. Green, John Ball, E. W. Smith, A. P. Campbell, and A. N. Lakens, Committee. James A. Knowles, Treasurer. John Ball, 96 Broad Street, Elizabeth, N.J., U.S.A., Secretary.

Frankford Camera Club of Philadelphia.—Established October, 1888. Meetings are held at the Industrial and Beneficial Institute, Frankford, Philadelphia. J. Howard Morrison, President. Robert T. Taylor, Vice-President. B. Antrim Holdeman, J. B. Lomax, H. H. Sutcliffe, Miss M. C. Shallcross, Miss M. Rover, and, *ex officio*, the President and Secretary, Committee. H. H. Sutcliffe, Treasurer. John M. Justice, 5016 Penn Street, Frankford, Philadelphia, Pa., U.S.A., Secretary.

Hartford Scientific Society (Photographic Section).—Section Formed 1894. Meetings held at 25 Pratt Street, Hartford, Conn., U.S.A. Dr. G. L. Parmele, Chairman. A. S. Clark, Joseph Merrett, and Miss Grace Johnson, Committee. Louis W. H. Gradisky, 225 Capen Street, Hartford, Conn., U.S.A., Secretary and Treasurer.

Harvard Camera Club.—Established 1889. Headquarters, Harvard University, Cambridge, Mass. Annual meeting, June. Meetings monthly. Vernon Maunse, President. C. P. M. Rumford, Vice-President. Percy Emerson Brown, 11 Weld Hall, Cambridge, Mass., U.S.A., Secretary and Treasurer.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Hoboken Camera Club.—Established March 22, 1889. The Regular Meetings of the Club take place the first Tuesday of each month. The Board of Governors meet the third Friday of each month. The Annual Meeting of the Club takes place the first Tuesday in March, when the election of officers takes place for the ensuing year. All Meetings are held at 1036 Park Avenue, Hoboken, N.J. A. J. Thomas, President. C. Sudhaus, Vice-President. Three Trustees (W. Schrader, A. Beyer, and E. E. Wooley), all the Officers of the Club, the House Committee (F. A. Muench), and the Entertainment Committee, Board of Governors. William Allen, Custodian. H. J. Kultenbach, Treasurer. A. L. Smith, 1045 Bloomfield Street, Hoboken, N.J., U.S.A., Secretary.

Irvington (N.J.) Art and Camera Club.—Established 1892. Meetings are held at Springfield and Union Avenues, Irvington, N.J., U.S.A. Edwin D. Harrison, President. F. H. Morrell, Vice-President. James Peckwell, jun., Treasurer. Melton Tompkins, Secretary.

Louisville Camera Club.—Established 1888. Meetings held at North-east corner of Fourth Avenue and Jefferson Street, Louisville, Ky. R. L. Stevens, 1100 West Main Street, Louisville, Ky., U.S.A., Secretary.

Lowell Camera Club.—Established January, 1889. Incorporated March, 1892. Meetings held at Central Block. Paul Butler, President. W. P. Atwood and F. T. Walsh, Vice-Presidents. Charles Runels, F. M. Goodhue, Fay H. Martin, and the Officers, Executive Committee. M. A. Taylor, Treasurer. George A. Nelson, 305 Summer Street, Lowell, Massachusetts, Secretary.

Lynn Camera Club.—Established January 1, 1888. Incorporated December 20, 1889. Regular Meetings, first Tuesday in each month. Annual Meeting, first Tuesday in January. All Meetings held at the Club House, 42 Broad Street. William H. Drew, President. J. N. Smith, Vice-President. W. H. Drew, J. N. Smith, J. W. Gibboney, A. J. Purinton, E. F. Bacheller, A. H. Carsley, W. B. Gifford, and W. A. Pevear, Committee. E. F. Bacheller, Treasurer. C. A. Lawrence, Club House, 42 Broad Street, Lynn, Mass., U.S.A., Secretary.

Mattapan Camera Club.—Established 1890. Meetings held at the private residence of Secretary, Brush Hill Road, Mattapan. John A. Locklin, President. Walter Hertzberg, Vice-President and Treasurer. Erdmann Sonnenbrodt, Box 83, Mattapan, Mass., Secretary.

Memphis Camera Club.—Established 1893. Meetings held at the Y.M.C.A. Buildings. S. J. Latta, President. A. Wardle, Vice-President. S. J. Latta, A. Wardle, Geo. O. Friedel, M. Stewart, E. I. Pinnel, Directors. Geo. O. Friedel, 165 Gayoso Street, Memphis, Tenn., U.S.A., Secretary and Treasurer.

Minneapolis Camera Club.—Incorporated 1892. W. B. Augir, President. W. H. McMullen, Vice-President. H. E. Murdock, J. S. Dodge, C. A. McCollorn, M.D., A. S. Williams, G. W. Beach, with the President, Vice-President, Treasurer, and Secretary, Board of Directors. G. A. Will, Treasurer. C. J. Hibbard, 17 South Fourth Street, Minneapolis, Minn., Secretary.

Mystic Camera Club.—Organized June 4, 1889. Incorporated March 17, 1891. Meetings held at 202 High Street, West Medford, Mass., U.S.A. Charles A. Smith, President. Warren M. Archibald, Vice-President. C. A. Smith, W. M. Archibald, C. A. Staniford, J. B. Thaxter, jun., J. F. Wade, B. D. B. Bourne, and E. B. Dennison, Executive Board. Joseph B. Thaxter, jun., Treasurer. Charles A. Staniford, 111 Cedar Street, Somerville, Mass., U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Newark (N.J.) Camera Club.—Established April 18, 1888. Meetings are held at the Club Rooms, 224 Market Street, Newark, N.J. William A. Halsey, President. William Archibald, Vice-President. H. W. Smith, William Archibald, Frank Olds, Miles Janson, Frederick Schuetz, D. S. Plumb, Henry Eberhardt, J. M. Foote, and Paul S. V. Thiery, Committee. J. M. Foote, Treasurer. D. S. Plumb, 24 Boudinot Street, Newark, N.J., U.S.A., Secretary.

New Britain Camera Club.—Established 1892. Headquarters, 210 Main Street. Annual meeting, January. Meetings, second and fourth Tuesdays in each month. E. F. Porter, President. G. A. Reckard, Vice-President. F. W. Wood, 273 Main Street, New Britain, Conn., U.S.A., Secretary and Treasurer.

New England Lantern Slide Exchange.—Established 1890. Will. C. Eddy, 88 Marshall Street, Medford, Mass., U.S.A., Secretary.

New Orleans Camera Club.—Established December 17, 1886. Meetings are held at 712 Union Street, New Orleans, La. Hon. Bernard C. Shields, President. W. Gowland, Vice-President. William Grimshaw, Treasurer. M. V. Haulard, 1729 Bienville Avenue, New Orleans, La., U.S.A., Secretary.

Newton Camera Club.—Established 1893. Meetings held at the Club House, Brookside Avenue, Newtonville, Mass., U.S.A. F. O. Stanley, President. E. E. Snyder, Vice-President. Austin S. Kilburn, West Newton, Mass., U.S.A., Secretary.

New York Camera Club.—Established 1888. Meetings are held at 314 Fifth Avenue, New York. Samuel W. Bridgham, President. Franklin Harper, Vice-President. Robert J. Devlin, Treasurer. Chas. W. Stevens, M.D., 33 West Thirty-third Street, New York City, U.S.A., Secretary.

Old Colony (Rockland, Mass.) Camera Club.—Established February 1 1890. Meetings held at Arnold Building, Liberty Street. David Smith, President. Emery H. Jenkins, Vice-President and Treasurer. David Smith, Rockland, Mass., U.S.A., Secretary.

Omaha Camera Club.—Established 1894. Meetings held at 1312 Farnam Street, Omaha, Neb. W. Durnall, 1312 Farnham Street, Omaha, Neb., U.S.A., Secretary.

Oneida Camera Club.—Established March 1, 1894. Meetings are held at the Club Rooms, Post-office Building, Oneida, N.Y. B. S. Teale, President. George R. Hanson, Vice-President. Jaeob Standt, Wesley Fisher, and C. M. Kingsbury, Committee. Albert Dygert, Treasurer. C. R. Baker, P.O. Block, Oneida, N.Y., U.S.A., Secretary.

Orange (N.J.) Camera Club.—Organized March 21, 1892. Incorporated May 19, 1893. Meetings held at Decker Building, Main Street, Orange, N.J. W. F. D. Crane, President. George A. Van Wagenen, M.D., Vice-President. W. H. Cheney, W. F. D. Crane, F. E. Gerbert, H. Joerns, G. E. Melendy, D. S. Plumb, T. J. Preston, jun., G. A. Van Wagenen, M.D., Executive Committee. D. S. Plumb, Treasurer. L. C. McDermott, East Orange, N.J., U.S.A., Secretary.

Oregon Camera Club.—Established January, 1895. Meetings are held at Room 715, Oregonian Building, Portland, Oregon. Edgar Felloes, President. W. H. Walker, Vice-President. Edgar Felloes, W. H. Walker, Milton P. Goldsmith, A. Anderson, Hugo B. Goldsmith, Executive Committee. A. Anderson, Treasurer. Milton P. Goldsmith, Room 314, Abington Building, Portland, Oregon, U.S.A. (Mail address, P.O. Box 93), Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Paterson Camera Club.—Established 1893. Meetings are held at 9 Lake Street. C. M. Giles, President. H. W. Gledhill, Vice-President. Wm. M. Moore, Treasurer. Chas. D. Cooke, Cooke Locomotive Works, Paterson, N.J., U.S.A., Secretary.

Photographers' Association of America.—Established 1880. Place of Meeting, Celoron, on Chautauqua Lake, State of New York. C. M. Hayes, President. J. Will. Kellmer and R. P. Bellsmith, Vice-Presidents. The Officers are the Executive Committee. George W. Varney, Treasurer. A. L. Bowersox, Dayton, Ohio, Secretary.

Photographers' Association of Iowa.—Established 1889. Meetings held at Des Moines, Iowa. G. S. Coman, President. E. S. Frey, First Vice-President. W. H. Jacobs, Second Vice-President. Theo. A. Brown, Treasurer. J. R. Hall, Monroe, Iowa, U.S.A., Secretary.

Photographers' Association of Missouri.—Established 1894. Meetings at Perth Springs, Mo., 1897. William Latour, President. O. L. Hutchins, First Vice-President. E. D. Fear, Second Vice-President. The President, Vice-Presidents, Secretary, and Treasurer, Executive Committee. Ellsworth Marks, Treasurer. A. S. Robertson, St. Louis, Mo., Secretary. Mr. Stone, Warrensburg, Mo., U.S.A., Assistant Secretary.

Photographers' Association of Ohio.—Office of Executive Committee, Hamilton, Ohio. A. L. Bowersox, President. George H. Barnum, Springfield, Ohio, U.S.A., Secretary.

Photographic Club of Baltimore City (*Md.*).—Established May, 1891. Meetings are held at Madison and Eutaw Streets, Baltimore City, Md. A. S. Murray, President. Dr. Frank Slothower, Vice-President. A. S. Murray, Dr. F. Slothower, A. J. Godby, F. W. McAllister, B. G. Buck, E. M. Barker, and Charles E. Needles, Board of Directors. E. M. Barker, Treasurer. Charles E. Needles, 404 Cathedral Street, Baltimore, Md., U.S.A., Secretary.

Photographic Society of Philadelphia.—Established 1862. Meetings held at 10 South Eighteenth Street, Philadelphia, Pa., U.S.A. Joseph H. Burroughs, President. Charles R. Pancoast and Robert S. Redfield, Vice-Presidents. Frank Bement, John C. Browne, John G. Bullock, Samuel Castner, jun., F. William Geisse, H. H. Furness, jun., William H. Rau, William H. Roberts, Benjamin Sharp, M.D., Walter P. Stokes, Henry Troth, and George Vaux, jun., Directors. Anthony W. Robinson, Treasurer. Edmund Stirling, 4517 Kingsessing Avenue, West Philadelphia, Secretary.

Pittsburg (*Pa.*) *Amateur Photographers' Society.*—Established 1886. Incorporated 1896. Meetings held at the Pittsburgh Carnegie Library. C. C. Craft, President. E. E. Kellar, Vice-President. C. C. Craft, E. E. Kellar, W. S. Clow, A. R. Neeb, H. L. Christy, W. J. Boston, W. J. Hunker, L. S. Clarke, and J. H. Hunter, Board of Trustees. W. J. Hunker, Treasurer. Joseph H. Hunter, 520 Green Street, Pittsburg, Pa., U.S.A., Secretary.

Pittsfield Camera Club.—Established February 1, 1892. Meetings held at houses of members. J. F. Middleton, President. J. D. Roscoe, Vice-President. J. F. Middleton, J. D. Roscoe, J. E. Colton, J. H. Musgrove, A. N. French, C. G. Tompkins, and S. S. Stowell, Executive Committee. A. N. French, C. S. Meigs, and J. E. Colton, Lantern-slide Committee. J. H. Musgrove, Treasurer. J. E. Colton, 768 North Street, Pittsfield, Mass., U.S.A., Secretary.

Portland (*Maine*) *Camera Club.*—Established 1891. Meetings held at the Club Rooms. Stanley P. Warren, M.D., President. C. T. Whipple, Treasurer, Frederick Fox, jun., 66 Union Street, Portland, Maine, U.S.A., Secretary.

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

Plainfield (N.J.) Camera Club.—Established 1887. Meetings held at the Club Gallery, Babcock Building. Harold Serrell, President. John E. Stewart, Vice-President. H. Serrell, J. E. Stewart, J. Hervey Doane, Mrs. A. W. Rand, Otto Arens, and Robert L. Lee, Board of Directors. Mrs. A. W. Rand, Treasurer. J. Hervey Doane, 115 Park Avenue, Plainfield, N.J., U.S.A., Secretary.

Postal Photographic Club.—Established December, 1888. Albert J. Le Breton (Washington, D.C.), President. Frank A. Marble, North Adams, Mass., Secretary and Treasurer.

Providence Camera Club.—Established 1883. Incorporated 1889. Club Rooms, 87 Weybosset Street, Providence, R.I. Frederick P. Wilbur, President. W. Penn Mather, Vice-President. Frederick P. Wilbur, F. E. Leonard, J. E. Davison, E. A. Darling, J. A. Miller, jun., F. C. Hodgman, C. A. Stoddard, J. H. Tucker, and R. C. Fuller, Executive Committee. C. A. Stoddard, E. A. Darling, and F. P. Wilbur, Room Committee. R. C. Fuller, J. A. Miller, jun., and F. E. Leonard, Lantern Committee. J. E. Davison, F. C. Hodgman, and J. H. Tucker, Entertainment Committee. Charles A. Stoddard, Librarian. Edmund A. Darling, Treasurer. F. E. Leonard, 75 Warren Avenue, Pawtucket, Recording Secretary. J. Eliot Davison, Pawtucket, Corresponding Secretary.

Putnam (Conn.) Camera Club.—Established January, 1888. Headquarters at its Club Rooms, Putnam, Connecticut. Regular Meetings are held on the first Friday in each month. The Annual Field Day occurs on the first Wednesday in June. George E. Dresser, President. Edward F. Whitmore, Treasurer. Eric H. Johnson, Putnam, Connecticut, U.S.A., Secretary.

San Diego (Cal.) Camera Club.—Established 1892. Meetings are held at D Street between Fourth and Fifth Streets. Dr. Joseph Rhodes, President. Charles Wellborn, Vice-President. Miss Laura B. Anderson, Treasurer. W. W. Whiston, 1934 Fourth Street, San Diego, Cal., U.S.A., Secretary.

Schuylkill Camera Club.—Established July 5, 1889. Meetings are held at the Q.O.O.F. Hall, Market Street, Pottsville, Pa. A. W. Sheafer, President. Miss Elena Roads, Vice-President. The Officers are the Committee. W. L. Sheafer, Treasurer. B. S. Simonds, 1339 West Norwegian Street, Pottsville, Pa., Secretary.

Society of Amateur Photographers of New York.—Established March 10, 1884. Meetings are held at 113 West Thirty-eighth Street. C. C. Roumage, President. Dr. J. H. Stebbins, jun., Vice-President. Dr. J. T. Nagle, E. T. Birdsall, Albert Stetson, Louis T. Brush, C. W. Canfield, Harry Coutant, G. F. Basset, and Frank M. Hale, Board of Directors. W. E. Johnson, Treasurer. R. L. Bracklow, Recording Secretary. T. J. Burton, 113 West Thirty-eighth Street, New York City, U.S.A., Corresponding Secretary.

Springfield (Mass.) Camera Club.—Organized 1886. Meetings are held at State and Dwight Streets, Springfield, Mass., U.S.A. William B. Sleigh, President. William B. Sleigh, Bion D. Wheeler, William P. Draper, Andrew N. Wilton, and Hinsdale Smith, Executive Committee. A. D Copeland and George H. Van Norman, Room Committee. Bion D. Wheeler, 307 Main Street, Springfield, Mass., U.S.A., Secretary.

Stevens (Hoboken, N.J.) Photographic Society.—Established 1880. Meetings held at the Stevens Institute, Hoboken, N.J. R. P. Jennings, President. — Ode, Vice-President. L. M. De Azeveda and Jos. Stehlin, Committee. Charles L. Wachter, Treasurer. E. C. Voorhees, Stevens Institute, Hoboken N.J., U.S.A., Secretary

AMERICAN PHOTOGRAPHIC SOCIETIES—*Continued.*

St. Louis Camera Club.—Established 1885. Meetings held at 911 North Vandeventer Avenue. Walter H. Wilcox, President. M. T. Corwin, Vice-President. Charles M. Alexander, Chairman of the Lantern Slide Committee. H. B. Alexander, 4028 Westminster Place, St. Louis Mo., U.S.A. Secretary and Treasurer

St. Louis Photographic Society.—Established December, 1896. Meetings held at the Rooms in Y.M.C.A. Building. Grand and Franklin Avenues. Robert E. M. Bain, President. John B. Holman, Vice-President. John D. Elliott, 321 Locust Street, St. Louis, Mo., Secretary and Treasurer.

St. Paul Camera Club.—Established 1892. Meetings are held at corner of Third and Jackson Street, St. Paul, Minn. James Paris, President. D. F. Brown, Vice-President. W. B. Thorne, Treasurer. W. J. Sonnen, c/o St. Paul Fire and Marine Insurance Company, St. Paul, Minn., U.S.A., Secretary.

Sunny Side Camera Club.—Established 1891. Meetings are held at 5900 South Broadway, St. Louis, Mo. Professor William A. Bricner, 1235 South Broadway, St. Louis, Mo., U.S.A., Secretary.

Syracuse Camera Club.—Organized October, 1886. Incorporated January 19, 1892. Meetings held at Butler Block, 322 South Salina Street, Syracuse, N.Y. Herbert F. Smith, President. George E. Timmins, Vice-President. The President, Vice-President, Secretary, Treasurer, and S. W. Rose, Dr. A. Clifford Mercer, F. J. Schnauber, and F. L. Barnes, Board of Directors. Leray Eldredge, Treasurer. Frederick W. Field, c/o Solway Process Company, Syracuse, N.Y., U.S.A., Secretary.

Tech Camera Club.—Established September, 1889. Meetings, bi-monthly at half-past seven p.m., in the Boynton Hall of the Polytechnic Institute Worcester, Mass. Dark room and Printing room also at Boynton Hall. The purpose of the Meetings is to discuss photographic subjects and, as far as possible, to diffuse a knowledge of the science and art among the members of the Institute. The Executive Committee transact all business connected with the Club. H. J. Fuller, President. A. J. Smith, Vice-President. J. W. Higgins, 228 West Street, Worcester, Mass., U.S.A., Treasurer and Secretary.

Technology Photographic Society.—Established 1893. Meetings are held at Massachusetts Institute of Technology, Boyleston Street, Boston, Mass. Herman A. Poppenhusen, President. Welles M. Partridge, Vice-President. President, Vice-President, Secretary, Treasurer, and Frederick Kleinschmidt, Committee. Arthur C. Lawley, Treasurer. E. Johnson Loring, Mass. Inst. Tech., Boston, Mass., U.S.A., Secretary.

Waterbury Photographic Society.—Established 1888. Meetings are held at Platt's Block, Waterbury, Conn. Oscar A. Ziglatzki, President. George F. Hodges, Vice-President. Henry T. Stedman, George H. Ward, and George Husker, Executive Committee. Henry T. Stedman, Treasurer. Hollyday Emery, Waterbury, Conn., U.S.A., Secretary.

Watertown (N. Y.) Camera Club.—Meetings held at 4 Paddock Arcade, Watertown, N.Y. A. R. Wilson, President. George Mowe, Treasurer. C. A. Wilson, 2½ Public Square, Watertown, N.Y., U.S.A., Secretary.

Worcester Camera Club.—Re-established 1892. Meetings held at Walker Building, 405 Main Street, Worcester, Mass. Daniel F. Gay, 214 Main Street, Worcester, Mass., U.S.A., Secretary.

Young Ladies' Camera Club.—Established 1895. Meetings are held at Y.W.C.A. Rooms, 808 Nicollet Avenue, Minneapolis, Minn. Miss M. E. McIntyre, 1833 Portland Avenue, Minneapolis, Minn., U.S.A., Secretary.

FRENCH FLUID MEASURES.

THE cubic centimètre, usually represented by 'c.c.,' is the unit of the French measurement for liquids. It contains nearly seventeen minims of water; in reality, it contains 16·896 minims. The weight of this quantity of water is one gramme. Hence it will be seen that the cubic centimètre and the gramme bear to each other the same relation as our drachm for solids and the drachm for fluids, or as the minim and the grain. The following table will prove to be sufficiently accurate for photographic purposes:—

1 cubic centimètre	=	17	minims (as near as possible).								
2 cubic centimètres	=	34	,,								
3 ,,	=	51	,,								
4 ,,	=	68	,,	or	1 drachm	8 minims.					
5 ,,	=	85	,,	,,	1 ,,	25 ,,					
6 ,,	=	102	,,	,,	1 ,,	42 ,,					
7 ,,	=	119	,,	,,	1 ,,	59 ,,					
8 ,,	=	136	,,	,,	2 drachms	16 ,,					
9 ,,	=	153	,,	,,	2 ,,	33 ,,					
10 ,,	=	170	,,	,,	2 ,,	50 ,,					
20 ,,	=	340	,,	,,	5 ,,	40 ,,					
30 ,,	=	510	,,	,,	1 ounce	0 drachm	30 minims.				
40 ,,	=	680	,,	,,	1 ,,	3 drachms	20 ,,				
50 ,,	=	850	,,	,,	1 ,,	6 ,,	10 ,,				
60 ,,	=	1020	,,	,,	2 ounces	1 ,,	0 ,,				
70 ,,	=	1190	,,	,,	2 ,,	3 ,,	50 ,,				
80 ,,	=	1360	,,	,,	2 ,,	6 ,,	40 ,,				
90 ,,	=	1530	,,	,,	3 ,,	1 ,,	30 ,,				
100 ,,	=	1700	,,	,,	3 ,,	4 ,,	20 ,,				

THE CONVERSION OF FRENCH INTO ENGLISH WEIGHTS.

ALTHOUGH a gramme is equal to 15·4346 grains, the decimal is one which can never be used by photographers; hence in the following table it is assumed to be $15\frac{2}{5}$ grains, which is the nearest approach that can be made to *practical* accuracy:

1 gramme	=	$15\frac{2}{5}$	grains.			
2 grammes	=	$30\frac{4}{5}$	,,			
3 ,,	=	$46\frac{1}{5}$	,,			
4 ,,	=	$61\frac{3}{5}$	,,	.... or	1 drachm	$1\frac{3}{5}$ grain.
5 ,,	=	77	,,	.... ,,	1 ,,	17 grains.
6 ,,	=	$92\frac{2}{5}$	,,	.... ,,	1 ,,	$32\frac{2}{5}$,,
7 ,,	=	$107\frac{4}{5}$	,,	.... ,,	1 ,,	$47\frac{4}{5}$,,
8 ,,	=	$123\frac{1}{5}$	,,	.... ,,	2 drachms	$3\frac{1}{5}$,,
9 ,,	=	$138\frac{3}{5}$	,,	.... ,,	2 ,,	$18\frac{3}{5}$,,
10 ,,	=	154	,,	.... ,,	2 ,,	34 ,,
11 ,,	=	$169\frac{2}{5}$	,,	.... ,,	2 ,,	$49\frac{2}{5}$,,
12 ,,	=	$184\frac{4}{5}$	,,	.... ,,	3 ,,	$4\frac{4}{5}$,,
13 ,,	=	$200\frac{1}{5}$	,,	.... ,,	3 ,,	$20\frac{1}{5}$,,
14 ,,	=	$215\frac{3}{5}$	,,	.... ,,	3 ,,	$35\frac{3}{5}$,,
15 ,,	=	231	,,	.... ,,	3 ,,	51 ,,
16 ,,	=	$246\frac{2}{5}$	,,	.... ,,	4 ,,	$6\frac{2}{5}$,,
17 ,,	=	$261\frac{4}{5}$	,,	.... ,,	4 ,,	$21\frac{4}{5}$,,
18 ,,	=	$277\frac{1}{5}$	,,	.... ,,	4 ,,	$37\frac{1}{5}$,,
19 ,,	=	$292\frac{3}{5}$	,,	.... ,,	4 ,,	$52\frac{3}{5}$,,
20 ,,	=	308	,,	.... ,,	5 ,,	8 ,,
30 ,,	=	462	,,	.... ,,	7 ,,	42 ,,
40 ,,	=	616	,,	.... ,,	10 ,,	16 ,,
50 ,,	=	770	,,	.... ,,	12 ,,	50 ,,
60 ,,	=	924	,,	.... ,,	15 ,,	24 ,,
70 ,,	=	1078	,,	.... ,,	17 ,,	58 ,,
80 ,,	=	1232	,,	.... ,,	20 ,,	32 ,,
90 ,,	=	1386	,,	.... ,,	23 ,,	6 ,,
100 ,,	=	1540	,,	.... ,,	25 ,,	40 ,,

THE PHOTOGRAPHIC COPYRIGHT UNION.

The following are the rules as amended at the General Meeting, November 22nd, 1895.

Committee.

President, Frank Bishop (Marion & Co.). *Vice-President*, Joseph J. Elliott (Elliott & Fry, Baker Street). *Treasurer*, Wm. Grove (Window & Grove, Baker Street). *Hon. Secretary*, J. Lillie Mitchell (London Stereoscopic Co., Ld.), 54 Cheapside, London, E.C. W. Crooke (Edinburgh), Wm. Downey (W. & D. Downey, Ebury Street), Alfred Ellis (Upper Baker Street), E. Frith (Frith & Co., Reigate), Jas. Lafayette (Dublin), Louis Wilson (G. W. Wilson & Co., Ld., Aberdeen), Warwick Brookes (Manchester), J. W. McGrath (Cork), F. M. Sutcliffe (Whitby). *Solicitors*, Messrs. Neish, Howell, & Macfarlane, 66 Watling Street, London, E.C. *Secretary*, Henry Gower, Photographic Section, London Chamber of Commerce, Botolph House, Eastcheap, London, E.C.

Title.

I.—The name of the Society shall be the 'Photographic Copyright Union.'

Objects.

II.—The objects of the Union shall be to secure and protect Photographic Copyrights, to suppress piracies, and generally to promote the interests of the profession.

Membership.

III.—Photographers who have given their signed adherence to the Union shall be considered duly elected, and all professional and amateur photographers and photographic publishers shall be qualified to become Members of the Union under the rules, provided they be introduced by a Member.

IV.—The Committee shall have the power of nominating as Honorary Members any persons resident abroad or in the colonies, whom they may in their discretion select as corresponding Agents for the Union.

Funds.

V.—There shall be a Donation Fund and a Reserve Fund. The Donation Fund shall be deposited in the name of the Union, and cheques drawn therefrom as per Rule XI. The Reserve Fund shall be deposited at the Bankers in the joint names of the President and Treasurer of the Union, and only in the event of a deficiency in the Donation Fund shall expenses be defrayed out of the Reserve Fund.

VI.—There shall be no Annual Subscription.

VII.—The Working Expenses of the Union shall be met by Voluntary Donations.

Reserve Fund.

VIII.—A Reserve Fund shall be created, to consist of Voluntary Donations and of such other funds as may be found available for the purpose.

Officers.

IX.—The management of the Union shall be by a Committee of nine Members (but with power to increase their number), two of whom shall

retire annually, but shall be eligible for re-election. The Committee shall elect annually from among themselves a President, a Vice-President, a Treasurer, and an Hon. Secretary, and the Committee shall be Members of the Photographic Trade Section of the London Chamber of Commerce.

X.—The mode of Election of Members of the Committee shall be by the vote of the General Members of the Union.

XI.—The Bankers of the Union shall be the National Provincial Bank of England, St. Marylebone Branch, Baker Street, W. All cheques shall be signed by the Treasurer, and a Member of the Committee, and counter-signed by the Secretary.

XII.—The Standing Counsel, Solicitors, and Secretary of the Union shall be appointed by the Committee, and shall hold office for such time and upon such terms as may be determined by the Committee. No Member of the Committee shall be eligible as Auditor.

MEETINGS OF COMMITTEE.

XIII.—The Committee shall meet monthly on the first Wednesday in each month, but a Meeting may be called by the Secretary, upon the request of any two Members of the Committee. Three clear days at least must elapse between the issue of the notices (unless the Secretary shall mark them 'very urgent') and the day for which the Meeting is called.

XIV.—Five shall form a quorum of the Committee, except where otherwise hereinafter provided. Questions arising at any Meeting of the Committee shall be decided by a majority of votes, and, in case of an equality of votes, the Chairman of the Meeting shall, in addition to his original vote, have a casting vote.

ACCOUNTS.

XV.—Proper books of account shall be kept at the offices of the Union, and all such accounts shall be audited by the Auditors once in every year, and oftener if the Committee shall so determine. The Auditors shall be elected by the Members of the Union present at the General Meeting. All moneys received by the Secretary shall be paid to the Treasurer within seven days.

GENERAL MEETINGS.

XVI.—A General Meeting of the Union shall be held at the end of September or beginning of October in each year, and of such Meeting seven days' notice shall be sent to each Member, together with the report (if any) of the Committee, and an abstract or short statement of the accounts of the Union, together with a note of any alterations of and additions to the Rules that may be proposed. Extraordinary General Meetings shall be summoned at any time, upon the requisition of twenty Members of the Union. At any such Meeting the Rules of the Union may be added to or altered by the vote of two-thirds of the Members present, provided that fourteen days' prior notice has been given to the Secretary stating the proposed additions or alterations. Fifteen Members shall form a quorum at such Meetings, and the Chairman shall have a casting vote.

WORK OF THE UNION.

XVII.—The Society will undertake to register the work of any Member who desires them to do so upon the payment of 1*s*. 6*d*., which

is inclusive of the fee of 1*s*. at Stationers' Hall, but the Union shall incur no responsibility in case any such registration shall be held to be defective by any Court of Law.

XVIII.—Any Member shall have the privilege of referring the application of any Publisher or other person, who may desire to copy his works, to the Secretary to arrange terms for the same. A record will be kept of all licences and permissions negotiated by the Union, who shall be entitled to charge a commission of ten per cent. on all sums obtained by them in this manner for a Member.

XIX.—Members whose work has been infringed, and who wish the Union to obtain redress for them, must send the Secretary an original photograph, the piracy complained of, a copy of the registration form, the place and date of purchase of the piracy, and the name and address of the person by whom purchased, together with all correspondence that may have any reference to the piracy in question. The Secretary, having satisfied himself and any one Member of the Committee that the essential preliminaries to registration have been duly observed, shall then submit the case to the Solicitor, who will advise the Secretary upon it. A quorum of three of the Committee shall have power to give the Solicitor authority to proceed, but in urgent cases an action may be commenced by the Solicitor, should he deem it advisable, before the Committee have time to sit, but not before obtaining the written authority of the Member or Members interested, and in such cases, until the action of the Solicitor be ratified by three Members of the Committee, the Union shall not be liable for any costs.

XX.—If when a case, at the request of a Member, has been conducted by the Union, and compensation by way of penalties, or damages, or otherwise, be obtained, the net proceeds shall be divisible as follows: Two-thirds shall go to the Member whose copyright has been infringed, and one-third to the Reserve Fund of the Union. If no damages are obtained, then the expenses shall be borne as follows: Fifty per cent. shall be paid to the Union by the Member on whose behalf the action was taken, and thereafter fifty per cent. by the Union.

XXI.—In all cases where the aid of the Union has been invoked, and compensation obtained for a Member without litigation, the Union shall deduct twenty-five per cent. of the amount obtained after deducting expenses, and shall pay the balance to the Member.

XXII.—That the Committee shall have the power, should they deem it advisable, to give such rewards as they shall agree upon to any one who gives such information as shall lead to the conviction of an offender, or to successful litigation.

XXIII.—That no Member shall allow a Copyright portrait photograph, or figure subject, belonging to him to be reproduced (whether registered or not) at a less fee than 10*s*. 6*d*. up to and including cabinet size, 6 × 4 inches, or for one guinea reproduced beyond cabinet size and up to and including 12 × 10 inches, on each occasion and for each different publication or form in which it is used, but he shall be at liberty to charge a larger fee, according to his own ideas as to its value. No Member shall allow a Copyright photograph of landscape or public ceremonials which belong to him to be reproduced for a less fee than 10*s*. 6*d*.

XXIV.—That Members be invited to seek advice and information of the Union through the Secretary, which shall be given free of charge.

XXV.—That the Society will assist Members in assigning Copyrights, and help them in every possible way in all matters relating to Copyrights.

The following are—

COPIES OF FORMS ISSUED BY THE PHOTOGRAPHIC COPYRIGHT UNION.

[2d. per dozen.—*Prices include Postage.*]

FORM A.]

Photographic Section of the London Chamber of Commerce.

BOTOLPH HOUSE, EASTCHEAP.

Photographic Copyright Union.

In reply to your request for permission to copy my photograph of..............
..............................I beg to state that, being a Member of the above Photographic Copyright Union, I am bound by its regulations to make a charge for the permit required. My fee in this case will be.................and on receipt of this amount I will forward you official permission. ....

....

NOTICE.—Any one copying my photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining my permission, render themselves liable to an action for infringement of my copyright.

FORM B.] Receipt granting permission to use Copyright Photographs.

Issued by the Photographic Copyright Union.

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.........*day of*... ....189..,

In consideration of the sum of......................hereby acknowledged, you are authorised to reproduce, by.......................process, my Copyright Photograph of..in any size not exceeding........................ my name to be printed under each impression.

This Permission and Fee is for reproduction in.................................... and for one issue only, and the subject may not be reproduced or sold as an independent illustration separate from the above publication and its accompanying letterpress. If any other use is desired, a fresh Permission and Payment is required. ....

NOTICE.—Any one copying my photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining my permission, render themselves liable to an action for infringement of my copyright.

FORM C.] Receipt granting permission to use Copyright Photographs.

Issued by the Photographic Copyright Union.

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.........*day of*........................189...

In consideration of the sum of....................*hereby acknowledged, you are authorised to reproduce, by*......................*process, our Copyright Photograph of*...*in any size not exceeding*...................*our name to be printed under each impression.*

This Permission and Fee is for reproduction in................................ *and for one issue only, and the subject may not be reproduced or sold as an independent illustration separate from the above publication and its accompanying letterpress. If any other use is desired, a fresh Permission and Payment is required.* ....

NOTICE.—Any one copying our photographs for the purposes of reproduction or illustration either in Newspaper, Magazine, Book, or any other form, without first obtaining our permission, render themselves liable to an action for infringement of our copyright.

[For the information of those interested in the law of copyright, the Act relating thereto is reproduced in the following pages.]

THE COPYRIGHT (WORKS OF ART) ACT (1862).

An Act for amending the Law relating to Copyright in Works of the Fine Arts, and for repressing the Commission of Fraud in the Production and Sale of such Works.

WHEREAS by law, as now established, the authors of paintings, drawings, and photographs, have no copyright in such their works, and it is expedient that the law should in that respect be amended: Be it therefore enacted by the Queen's Most Excellent Majesty, by and with the advice and consent of the Lords spiritual and temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

Copyright in Works Hereafter Made or Sold to Vest in the Author for his Life, and for Seven Years after his Death.

1. The author, being a *British* subject or resident within the dominions of the Crown, of every original painting, drawing, and photograph which shall be or shall have been made either in the *British* dominions or elsewhere, and which shall not have been sold or disposed of before the commencement of this Act, and his assigns, shall have the sole and exclusive right of copying, engraving, reproducing and multiplying such painting or drawing, and the design thereof, or such photograph, and the negative thereof, by any means and of any size, for the term of the natural life of such author, and seven years after his death; provided that when any painting or drawing, or the negative of any photograph, shall for the first time after the passing of this Act be sold or disposed of, or shall be made or executed for or on behalf of any other person for a good or a valuable consideration, the person so selling or disposing of or making or executing the same shall not retain the copyright thereof, unless it be expressly reserved to him by agreement in writing, signed, at or before the time of such sale or disposition, by the vendee or assignee of such painting or drawing, or of such negative of a photograph, or to the person for or on whose behalf the same shall be so made or executed, but the copyright shall belong to the vendee or assignee of such painting or drawing, or of such negative of a photograph, or to the person for or on whose behalf the same shall have been made or executed; nor shall the vendee or assignee thereof be entitled to any such copyright, unless, at or before the time of such sale or disposition, and agreement in writing, signed by the person so selling or disposing of the same, or by his agent duly authorised, shall have been made to that effect.

Copyright not to Prevent the Representation of the Same Subjects in Other Works.

2. Nothing herein contained shall prejudice the right of any person to copy or use any work in which there shall be no copyright, or to represent any scene or object, notwithstanding that there may be copyright in some representation of such scene or object.

Assignments, Licenses, &c., to be in Writing.

3. All copyright under this Act shall be deemed personal or moveable estate, and shall be assignable at law, and every assignment thereof, and every license to use or copy by any means or process the design or work which shall be the subject of such copyright, shall be made by some note or memorandum in writing, to be signed by the proprietor of the copyright, or by his agent appointed for that purpose in writing.

Register of Proprietors of Copyrights in Paintings, Drawings, and Photographs to be kept at Stationers' Hall, as in 5 & 6 Vict., cap. 45.

4. There shall be kept at the Hall of the Stationers' Company, by the Officer appointed by the said Company for the purposes of the Act passed in sixth year of Her present Majesty, intituled *An Act to Amend the Law of Copyright*, a book or books, entitled 'The Register of Proprietors of Copyright in Paintings, Drawings, and Photographs,' wherein shall be entered a memorandum of every copyright to which any person shall be entitled under this Act, and also of every subsequent assignment of any such copyright; and such memorandum shall contain a statement of the date of such agreement or assignment, and of the names of the parties thereto, and of the name and place of abode of the person in whom such copyright shall be vested by virtue thereof, and of the name and place of abode of the author of the work in which there shall be such copyright, together with a short description of the nature and subject of such work and in addition thereto, if the person registering shall so desire, a sketch, outline, or photograph of the said work, and no proprietor of any such copyright shall be entitled to the benefit of this Act until such registration, and no action shall be sustainable nor any penalty recoverable in respect of anything done before registration.

Certain Enactments of 5 and 6 Vict., c. 45, to Apply to the Books to be Kept under this Act.

5. The several enactments in the said Act of the sixth year of Her present Majesty contained, with relation to keeping the register book thereby required, and the inspection thereof, the searches therein, and the delivery of certified and stamped copies thereof, the reception of such copies in evidence, the making of false entries in the said book, and the production in evidence of papers falsely purporting to be copies of entries in the said book, the application to the Courts and Judges by persons aggrieved by entries in the said book, and the expunging and varying such entries, shall apply to the book or books to be kept by virtue of this Act, and to the entries and assignments of copyright and proprietorship therein under this Act, in such and the same manner as if such enactments were here expressly enacted in relation thereto, save and except that the forms of entry prescribed by the said Act of the sixth year of Her present Majesty may be varied to meet the circumstances of the case, and that the sum to be demanded by the officer of the said Company of Stationers for making any entry required by this Act shall be one shilling only.

Penalties on Infringement of Copyright.

6. If the author of any painting, drawing, or photograph in which there shall be subsisting copyright, after having sold or disposed of such

copyright, or if any other person, not being the proprietor for the time being of copyright in any painting, drawing, or photograph, shall, without the consent of such proprietor, repeat, copy, colourably imitate, or otherwise multiply for sale, hire, exhibition, or distribution, or cause or procure to be repeated, copied, colourably imitated, or otherwise multiplied for sale, hire, exhibition, or distribution, any such work or the design thereof, or, knowing that any such repetition, copy, or other imitation has been unlawfully made, shall import into any part of the United Kingdom, or sell, publish, let to hire, exhibit, or distribute, or offer for sale, hire, exhibition, or distribution, or cause or procure to be imported, sold, published, let to hire, distributed, or offered for sale, hire, exhibition, or distribution, any repetition, copy, or imitation of the said work, or of the design thereof, made without such consent as aforesaid, such person for every such offence shall forfeit to the proprietor of the copyright for the time being a sum not exceeding ten pounds; and all such repetitions, copies, and imitations, made without such consent as aforesaid, and all negatives of photographs made for the purpose of obtaining such copies, shall be forfeited to the proprietor of the copyright.

Penalties on Fraudulent Productions and Sales.

7. No person shall do or cause to be done any or either of the following Acts: that is to say,—

First, no person shall fraudulently sign or otherwise affix, or fraudulently cause to be signed or otherwise affixed, to or upon any painting, drawing, or photograph, or the negative thereof, any name, initials, or monogram:

Secondly, no person shall fraudulently sell, publish, exhibit, or dispose of, or offer for sale, exhibition, or distribution, any painting, drawing, or photograph, or negative of a photograph, having thereon the name, initials, or monogram of a person who did not execute or make such work:

Thirdly, no person shall fraudulently utter, dispose, or put off, or cause to be uttered or disposed of, any copy or colourable imitation of any painting, drawing, or photograph, or negative of a photograph, whether there shall be subsisting copyright therein or not, as having been made or executed by the author or maker of the original work from which such copy or limitation shall have been taken.

Fourthly, where the author or maker of any painting, drawing, or photograph, or negative of a photograph, made either before or after the passing of this Act, shall have sold or otherwise parted with the possession of such work, if any alteration be afterwards made therein by any other person, by addition or otherwise, no person shall be at liberty, during the life of the author or maker of such work, without his consent, to make or knowingly to sell or publish, or offer for sale, such work or any copies of such work so altered as aforesaid, or of any part thereof, as or for the unaltered work of such author or maker.

Penalties.

Every offender under this section shall, upon conviction, forfeit to the person aggrieved a sum not exceeding ten pounds, or not exceeding double the full price, if any, at which all such copies, engravings,

imitations, or altered works shall have been sold or offered for sale; and all such copies, engravings, imitations, or altered works shall be forfeited to the person, or the assigns, or legal representatives of the person whose name, initials, or monogram shall be so fraudulently signed or affixed thereto, or to whom such spurious or altered work shall be so fraudulently or falsely ascribed as aforesaid: Provided always, that the penalties imposed by this section shall not be incurred unless the person whose name, initials, or monogram shall be so fraudulently signed or affixed, or to whom such spurious or altered work shall be so fraudulently or falsely ascribed as beforesaid, shall have been living at or within twenty years next before the time when the offence may have been committed.

Recovery of Pecuniary Penalties.

8. All pecuniary penalties which shall be incurred, and all such unlawful copies, imitations, and all other effects and things as shall have been forfeited by offenders, pursuant to this Act, and pursuant to any Act for the protection of copyright engravings, may be recovered by the person hereinbefore and in any such Act as aforesaid empowered to recover the same respectively, and hereinafter called the complainant or the complainer, as follows:

In *England* and *Ireland*, either by action against the party offending or by summary proceeding before any two Justices having jurisdiction where the party offending resides:

In *Scotland*, by action before the Court of Session in ordinary form, or by summary action before the Sheriff of the County where the offence may be committed or the offender resides, who, upon proof of the offence or offences, either by confession of the party offending or by the oath or affirmation of one or more credible witnesses, shall convict the offender, and find him liable to the penalty or penalties aforesaid, as also in expenses; and it shall be lawful for the Sheriff, in pronouncing such judgment for the penalty or penalties and costs, to insert in such judgment a warrant, in the event of such penalty or penalties and costs not being paid, to levy and recover the amount of the same by poinding: Provided always, that it shall be lawful to the Sheriff, in the event of his dismissing the action and assoilzieing the defender, to find the complainer liable in expenses, and any judgment as to be pronounced by the Sheriff in such summary application shall be final and conclusive, and not subject to review by advocation, suspension, reduction, or otherwise.

Superior Courts of Record in which any Action is Pending may Make an Order for an Injunction, Inspection, or Account.

9. In any action in any of Her Majesty's Superior Courts of Record at *Westminster* and in *Dublin*, for the infringement of any such copyright as aforesaid, it shall be lawful for the Court in which such action is pending, if the Court be then sitting, or if the Court be not sitting then, for a judge of such Court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, or account, and the proceedings therein respectively, as to such Court or Judge may seem fit.

Importation of Pirated Works Prohibited.—Application in such Cases of Customs Act.

10. All repetitions, copies, or imitations of paintings, drawings, or photographs, wherein or in the design whereof there shall be subsisting copyright under this Act, and all repetitions, copies, and imitations of the design of any such painting or drawing, or of the negative of any such photograph, which, contrary to the provisions of this Act, shall have been made in any Foreign State, or in any part of the *British* dominions, are hereby absolutely prohibited to be imported into any part of the United Kingdom except by or with the consent of the proprietor of the copyright thereof, or his agent authorised in writing; and if the proprietor of any such copyright, or his agent, shall declare that any goods imported are repetitions, copies, or imitations of any such painting, drawing, or photograph, or of the negative of any such photograph, and so prohibited as aforesaid, then such goods may be detained by the Officers of Her Majesty's Customs.

Saving of Right to Bring Action for Damages.

11. If the author of any painting, drawing, or photograph, in which there shall be subsisting copyright, after having sold or otherwise disposed of such copyright, or if any other person, not being the proprietor for the time being of such copyright, shall, without the consent of such proprietor, repeat, copy, colourably imitate, or otherwise multiply, or cause to procure to be repeated, copied, or colourably imitated, or otherwise multiplied, for sale, hire, exhibition, or distribution, any such work or the design thereof, or the negative of any such photograph, or shall import or cause to be imported into any part of the United Kingdom, or sell, publish, let to hire, exhibit, or distribute, or offer for sale, hire, exhibition, or distribution, or cause or procure to be sold, published, let to hire, exhibited, or distributed, or offered for sale, hire, exhibition, or distribution, any repetition, copy, or imitation of such work, or the design thereof, or the negative of any such photograph, made without such consent as aforesaid, then every such proprietor, in addition to the remedies hereby given for the recovery of any such penalties, and forfeiture of any such things as aforesaid, may recover damages by and in a special action on the case, to be brought against the person so offending, and may in such action recover and enforce the delivery to him of all unlawful repetitions, copies, and imitations, and negatives of photographs, or may recover damages for the retention or conversion thereof: Provided that nothing herein contained, nor any proceeding, conviction, or judgment, for any act hereby forbidden, shall effect any remedy which any person aggrieved by such Act may be entitled to either at law or in equity.

Provisions of 7 *&* 8 *Vict.*, *c.* 12, *to be Considered as Included in this Act.*

12. This Act shall be considered as including the provisions of the Act passed in the Session of Parliament held in the seventh and eighth years of Her present Majesty, intituled *An Act to Amend the Law relating to International Copyright*, in the same manner as if such provisions were part of this Act.

...y BYRNE & Co.,
Richmond

THE WELLINGTON
PLATINO MATT BROMIDE.

SUMMARY.

ONE of the features of the past year has been the great development of animated photography, which forms the subject of the editorial article that follows this summary. This development has been so marked as to give an unmistakable impetus to several branches of photographic industry—notably celluloid film and apparatus manufacture. We have every confidence that still further developments await this department of photography.

COLOUR PHOTOGRAPHY.

Colour photography in the earlier part of the year attracted no inconsiderable amount of notice, but of actual progress there is nothing to record. Mr. Bennetto, in the spring, showed by projection a number of transparencies in natural colours, which excited much admiration and discussion; but the process was not revealed, and at the time of writing nothing whatever is known of it. In February a process due to Messrs. Dansac & Chassagne was introduced. The results, in the forms both of transparencies and albumen paper prints, were put forward as natural colour effects obtained by what was alleged to be selective colour absorption —that is to say, the surface of the transparency or print was understood to be treated with a special solution which imparted to it the property, when red, green, and blue solutions were applied to it, of selecting the colours of the original in their proper order and relation. Notwithstanding the association of the names of some eminent men with the process, and the attempt to publicly demonstrate that it really was what it was alleged to be, there has been a complete failure to substantiate the claims that were made for it, and it is generally agreed that the Dansac-Chassagne process of natural-colour photography was simply a method of colouring prints with aniline compounds. On its merits the subject is not entitled to a more extended reference here, and those who require further details of a by no means satisfactory chapter in the chequered history of colour photography are referred to the volume of THE BRITISH JOURNAL OF PHOTOGRAPHY for 1897, wherein the Dansac-Chassagne process receives considerable attention in detail.

Halation—Radiography—Acetylene, &c.

Halation and the backing of plates is a subject to which practical photographers have addressed themselves with great interest during the year, and in the section of the Almanac headed 'Practical Notes and Experiences of the Year,' the reader will find a great deal of information bearing on the various preparations advocated for application to the glass sides of plates. Some of the dry-plate makers now send out plates ready backed with anti-halative substances that are removable without difficulty.

Radiography has failed to sustain its interest among photographers, although it is still a subject of unremitting experiment and investigation amongst chemists and physicists. In hospital, medical, and surgical practice, however, it is of enormous value, and it appears probable that, as an adjunct of the healing art, Professor Röntgen's discovery will long be gratefully recognised. It is interesting to note that Foreign Custom House officials are stated to find the X rays directly serviceable in the examination of travellers' luggage, &c.

The action of the Home Office in placing calcic carbide under the provisions of the Explosives Act, early in the year, threw a check on the progress of acetylene as a photographic illuminant, but the regulation has been modified to the extent of permitting small quantities of the carbide to be stored, and, with the insurance offices disposed to take a less unfavourable view of the danger of the new light, there is hope that the full possibilities of the light for projection and general work will, in due course, be availed of.

General Photography.

In the spring of 1898 the Royal Photographic Society propose holding, at the Crystal Palace, Sydenham, a great International Photographic Exposition, which shall be fully representative of the present position of photography in all its aspects. There is every indication that the Exhibition will be well supported.

The half-tone and three-colour block processes appear to be gaining in public favour, and steady advances are apparent in the qualities of the results.

With regard to ordinary photographic work, practically no change has to be chronicled. Glass as the favourite support for gelatino-bromide emulsion does not appear likely to be soon displaced, although several substitutes have been introduced. Anastigmatic flat-fielded lenses of large aperture are daily coming into greater use, and are gradually displacing older and less efficient forms.

With few exceptions, representative institutions in photography continue to widen their sphere of action. The Royal Photographic Society

is steadily increasing its membership, and, under the Presidency of the Earl of Crawford, is pursuing a policy of usefulness to the cause of photographic progress. The Photographic Convention and the Photographic Copyright Union have records of successful effort to show for the past year of their existence. A reference to the directory of photographic Societies will show that these useful bodies have not decreased in number, and there appears to be no doubt that the hold which photography has secured upon the public as a pursuit and pastime is not slackening.

Due chiefly to the energy of Sir J. Benjamin Stone, M.P., there has been established a National Photographic Record Association, the object of which is to collect photographic records of objects and scenes of interest throughout the British Isles with a view of depositing them in the British Museum, where they may be safely stored and be accessible to the public under proper regulations.

The Diamond Jubilee of Her Majesty led to considerable photographic activity, although, in common with many other industries, photography was said to have suffered from the great displacement of trade which that historical event induced ; but, on the whole, from whatsoever point it may be regarded, photography in 1897 exhibited unmistakably progressive tendencies, and the outlook for 1898 is distinctly encouraging and symptomatic of continued progress.

Obituary.

The losses by death to the photographic fraternity during the past year have been unusually heavy, and some well-known names have been removed. They include the following :—

Edgar Pickard the Thornton-Pickard Manufacturing Co.) (April 2, 1897).
F. W. Edwards (October 16, 1897).
George Dawson (July 11, 1897).
T. C. Turner (November 20, 1896).
Napoleon Sarony (of New York).
P. Meagher (May 8, 1897).
R. Kennett (December 4, 1896).
W. H. Harrison (August 10, 1897).
M. Carey Lea (April, 1897).

W. H. Harrison.

Mr. Harrison began life in the employ of the Great Western Railway in the Telegraph Department at Paddington. In 1865 he commenced writing for the *Engineer*. In 1868 he communicated to The British Journal of Photography a remarkable paper describing his discovery of a bromide emulsion dry plate, and also the use of an alkaline developer. In later years he was for some time editor of the *Photographic News*, and contributed to other photographic journals. As a writer on scientific

subjects, photography, engineering, and chemical industries were treated by him in a broad and comprehensive manner, especially those which had any application to photography; and lectures upon chemistry and experimental physics at the Royal Institution and other scientific bodies, both English and foreign, were never lost sight of.

George Dawson.

The late George Dawson, at the time of his death, was in his seventy-seventh year, and will be remembered by reason of his long association with King's College, in the capacity of Professor of Photography. He was formerly one of the editors of The British Journal of Photography, and was joint author, with the late Thomas Sutton, of *The Dictionary of Photography*. He also edited one of the earlier editions of Hardwich's *Photographic Chemistry*.

P. Meagher.

Mr. Meagher had been engaged in the production of photographic cameras for about half a century. He was formerly in the employ of the well-known camera-maker, Ottewill, who may be regarded as the source to which the best school of English camera-making traces its origin. If his name is not associated with the introduction of any very great novelty of design in the construction of cameras—we believe the side flap as a support for the camera body is the only distinctly original feature with which he can be credited—there is no doubt that a Meagher camera was long worthily put forward by practical photographers as a model of efficiency, durability, and excellence of construction.

R. Kennett.

Mr. Kennett, at the time of his death, was aged 79. It was in the year 1874, when the gelatino-bromide process was in the experimental stage, that Mr. Kennett, on June 9, read a paper before the London Photographic Society, in which he fully described his mode of preparing gelatino-bromide pellicle. He was also the inventor of Kennett's stand. There is no doubt that his experiments in the preparation of gelatine pellicle gave a great impetus to dry-plate photography.

M. Carey Lea.

It was not only in connexion with The British Journal of Photography, or with photography, that Mr. Carey Lea was known, for, in spite of his once prolific contributions—and how numerous these were readers of twenty and thirty years ago will remember—he found time to devote himself to other researches, chemical as well as physical, the

results of which were contributed to various scientific papers, but chiefly to *Silliman's Journal*, and occasionally the *Journal of the Franklin Institute*. But it is naturally in connexion with photography that he was best known. One of the earliest, and at that time perhaps one of the most practically useful, of his contributions was that in which he described his plate-cleaning solution, composed of bichromate of potash and sulphuric acid, a mixture that proved so effective, not only for that purpose, but for removing old films, and as a general laboratory detergent, that it became almost universally adopted, and familiarly known as 'Carey Lea.' The ferro-gelatine developer was another of his valuable contributions to wet-plate photographic practice, and consisted of a chemical combination of gelatine with the ordinary iron developer, which resulted in the deposition of the metallic silver, under the influence of the organic matter, in a much finer and closer state of division, and the consequent formation of a denser image. Originally published in 1865, the process of preparation was improved and simplified some years later, and it is not improbable that, had wet plates remained in general use, this combination would, ere now, have entirely displaced pyro, both for development and intensification. Another of his laboratory formulæ, of about the same date, was the method of intensification by means of Schlippe's salt, a sulphide of sodium and antimony, which would, even at the present day, find wider use in process work were it not for the evil-smelling character of the chief material. Mr. Carey Lea's name will be inseparably connected with collodion emulsion whenever the history of emulsion photography may be written. He took up the collodio-bromide process in 1866 or 1867, and kept working at that, or 'washed' emulsion, without intermission, right away until collodion was practically suppressed by gelatine.

This was the great point in Carey Lea's view of emulsion photography —free silver—and to him is due, undoubtedly, the credit of pointing out its use and value, though possibly modern workers, like many of the older ones, would differ from him in some of the details. The late Colonel Wortley, indeed, went further than Carey Lea in the matter of free silver, alleging that it was necessary to *saturate* the emulsion with free silver. Other modifications of the original process consisted in the addition of iodide and chloride of silver to the emulsion, points which also gave rise to very considerable controversy, while, as to the variations in "preservatives" and "organifiers" tried and recommended, it would be impossible to mention them. Carey Lea, however, introduced the method in a practical way of adding the organifier to the emulsion, so that the latter only required to be poured on to the glass and washed before use.

On the introduction of Mr. W. B. Bolton's washed collodion emulsion in 1874, Carey Lea was not slow to recognise its advantages, and at once

began experimenting, with the result that in 1875 or 1876 he published his washed-chlorido-bromide process, possessing a degree of rapidity far surpassing wet collodion. Whether this or similar processes would ever have come into general use is open to question, as the result of Carey Lea's experiments was rather to rob the original process of its simplicity without adding greatly to its advantages. Thus the precipitation of the emulsion, containing a large access of free silver, by means of a solution containing tannin, gallic and acetic acids, may be imagined to be one of some delicacy and requiring some manipulative skill to ensure success.

In 1870 he published a *Manual of Photography*, which went through two or three editions, and, though comparatively little known in this country, it is one of the best and most complete all-round works we have

F. W. Edwards, F.R.P.S.

He first carried on business in the Albany-road as an architectural photographer, and later, for a very long period, at 87, Bellenden-road, Peckham. For about two years he was connected with the firm of W. H. Ward & Co., Limited, Shaftesbury-avenue, and, on leaving them about twelve months ago, he recommenced business on his own account in Newman-street, Oxford-street.

About the time of the erection of the Albert Memorial, his photographs of the groups of statuary forming parts of it attracted attention. Later, his photographs of numerous Tinworth panels, taken on 23 × 18 plates, some of which were exhibited on the walls of the Royal Photographic Society's Exhibitions, brought him more into prominent notice. Latterly, he produced a very large number of cathedral interiors of a similar size. For some years he was a regular exhibitor—principally at the Royal and Falmouth, and received nearly thirty awards.

As a platinotype worker he was well known, and was almost the first, if not the first, to publicly demonstrate the hot-bath process, and handled with great ease prints of nearly fifty inches in length.

In July, 1889, he was unanimously appointed President of the second South London Photographic Society, and was annually, without any opposition, re-elected to that office.

ANIMATED PHOTOGRAPHY.

By The Editor.

The widespread interest with which what is conveniently called 'Animated Photography' is regarded by photographers and the general public, possibly justifies both the belief that its selection as the topic of the principal article in this Almanac will be acceptable to its readers, and the hope that the information here presented may be of service to those of them who have not had an opportunity of studying the subject. I at once admit that the following chapters are by no means exhaustive, but it is probable that they give, in a connected form, a fuller reference to the matter than has hitherto appeared in a photographic publication.

Animated photography, at the time of writing, is obviously only in the earlier stages of development. The wonder and interest which the contemplation on the lantern screen of the representation of objects appearing to move in the order of nature still provokes does not, of course, disguise the fact that much remains to be accomplished in the mechanics of this branch of photography before it can reasonably be claimed that the fullest justice has been done to its possibilities.

It will be observed that I have chosen the term 'animated photography' as the title of this series of chapters. Strictly speaking, its accuracy as a descriptive term is open to question; but, of the innumerable names that have been applied to this branch of photography, it is, perhaps, the one which most easily conveys what is meant in a universally understood form; hence its adoption here.

I.—PERSISTENCE OF VISION.

To understand the principles upon which animated photography is based necessitates some knowledge of the underlying theory involved, viz., persistence of vision; but, fortunately, this does not place a heavy tax on the understanding, as that theory is exceedingly simple to realise. 'The retina of the eye has the physiological property of retaining for a brief time the impression of an image after the object which has produced it has disappeared. The duration of this retinal picture is estimated at one-tenth of a second; so that, if an image is placed before our eyes ten times in a second, the idea of discontinuity is lost, and the images appear to be in continual evidence. If the images shown to us are represented in the successive positions assumed by the object in motion, the im-

pression conveyed to the eye is that of a continuous movement without intermission. If the photographs are presented to the eye at the same intervals as separate the successive exposures, the movement will appear as if it actually took place.' *

This property of the retina is termed persistence of vision, and it will be easily understood, from the clear definition given in the preceding paragraph, what bearing the phenomenon has upon animated photography. When the series of photographs is being passed across the surface upon which they are projected, the eye is receiving probably between ten and thirty impressions per second; and, although these impressions reach the retina separately, it will be understood that in consequence of the fact that each impression remains for an appreciable length of time upon the retina before it is, so to speak, obliterated by those which succeed it, the effect upon the brain is not that of a series of disconnected and independent communications, but of a continuous and persistent sensation. Hence it is that we get the phenomenon of apparent motion on the screen with which every one is now familiar.

In a valuable paper† on the Cinematograph for attaching to the lantern, to which I shall again make reference, Mr. F. C. B. Cole illustrates, or rather defines, this phenomenon of the persistence of vision in a way which those who are acquainted with electricity may particularly appreciate.

'Describing it to an electrician,' he says, 'I might speak of it as "self-induction of the optic nerve." We find several analogies to this in electrical matters; for instance, the "persistence" of the arc in an ordinary arc lamp is just the property which enables it to be run on an alternating current circuit, for the reason that in a direct current system the arc appears to exist for a short time after the current has been cut off; thus, when run on an alternating system, the arc is maintained during the period of reversal; should the period of alteration become longer than the persistence of the arc, the light fails. However, the whole thing is summed up in this, that, when an image momentarily falls upon the retina of the eye, under ordinary conditions, it gradually fades away, and an appreciable time elapses before it entirely disappears.'

I quoted above from Marey's book on *Movement*. To avoid misconception, it may be well to state that this valuable work does not dea at any length with the subject of animated photography. It is what is termed chrono-photography that has long formed an object of study and experiment with this eminent *savant*, and by its aid he has been enabled to obtain much valuable photographic information relating to the analysis of movement of animals, fish, insects, human beings,

* *Movement*. By E. J. Marey. 1895. (P. 305). Published by William Heinemann, Bedford-street, Strand.

† Journal of the Camera Club, March, 1897.

quadrupeds, &c. But the synthetic reconstruction of those movements is obviously of secondary importance to the analysis of the various methods of locomotion, with which M. Marey has almost entirely occupied himself, so that the book lies somewhat outside the scope of animated photography. Nevertheless, the two branches of work parallelise at times, so that it is difficult for anybody who is interested in the photographic reproduction of the curves and positions taken by animals and moving bodies in their progression to be wholly indifferent to the purely pictorial side of the subject which animated photography clearly is. M. Marey's book, aside of these considerations, is a masterly treatise on the subject of the analysis of movement, and well deserves studying for itself.

II.—HISTORICAL NOTES.

The history of animated photography may be said to begin with the enunciation of the principles of the persistence of vision, about 100 years ago by Plateau who put those principles into practice by the production of an instrument termed the Phenakistoscope. This consisted of a card-board disc perforated at equal distances round the periphery by small slits. One side of the disc was blackened, and on the others a series of images were arranged representing men or animals in the various attitudes which corresponded to the successive stages of movement. When the disc was spun round on its axis opposite to a mirror and the eye applied to the blackened side on a level with the revolving slits, the reflections of the various images were seen one after another corresponding to the different attitudes assumed by the original object; thus conveying the impression of actual movement*. It is worthy of note that, as early as a century ago, we have a fulfilment of the essential conditions of successful animated photography—the rapid presentation to the eye of a series of successive pictures, each differing slightly from those that precede and follow it.

Plateau's instrument was, of course, improved upon in detail, but its principle has never wholly been departed from. Typical of the various adaptations to which it gave rise may be mentioned the well-known Zoetrope, or wheel of life (introduced about 1845), which still survives, and is capable of affording endless amusement in the family circle, and to young people. The Zoetrope consisted of a cylindrical chamber revolving on a vertical axis. Narrow upright slits were made round the brim, and inside the cylindrical wall a strip of paper was pasted, a series of images depicting the successive attitudes of a figure in motion. The cylinder being revolved, and the eye being placed axially to the slits, the impression of movement was, of course, obtained.

I am reminded by a friend that recently there was an article in the *Photographische Correspondenz*, by R. J. Sachers, of New York, on the

* Marey, p. 307.

projection of consecutive pictures. He points out that Captain Franz von Uchatius was the first to produce moving pictures in such a manner that a large number of people could see them simultaneously. Lieut. Field Marshal Ritter von Hauslab commissioned Captain Uchatius to endeavour to construct an instrument that would enable a number of spectators to see pictures by the Stampfer method—the stroboskopic disc. Uchatius invented such a machine, and obtained satisfactory results in 1845. He perfected his machine, and exhibited it in 1853 before the Imperial Academy of Science. The pictures were printed in transparent colours, and inserted in a wooden disc in the form of a circle, with equal intervening spaces. A second disc was provided with apertures in the form of a sector of a circle, each aperture corresponding to one of the pictures. This answered the purpose of the slits in Stampfer's disc. Both discs were mounted on the same axis, and turned by a handle. The whole was enclosed in a light-tight case, the only apertures being for the objective and the handle. When the discs were rotated, the images formed a moving picture.

Mr. Cole tells us that 'about 1869 or 1870 came the Praxinoscope, by Raynaud, an instrument which was of the same style as the Zoetrope, only the pictures were seen reflected in revolving mirrors. At this time we also hear of a Photoscope, by Mr. Talbot, in which microscopic views on glass were viewed through a lens as transparencies, and, as they rapidly succeeded each other, the effect of animation was produced; this,' he remarks, 'appears to be the first instrument of the kind to take advantage of photography.'*

On the other hand, Mr. Snowden Ward* credits Louis Ducos du Hauron, the French experimentalist in three-colour photography, with the invention in 1864, two French patents standing in his name, presumably for the photographic application of the principle, although it is not so expressly stated.

The Zoetrope and its congeners did not exhaust the non-photographic applications of the idea. Muybridge painted from his photographs of horses on to glass discs, and projected them by means of the lantern. Solid figures, too, were used in the Zoetrope, and the latter was subsequently adopted by Anschutz for reproductions of photographs, and is now sold or exhibited under the name of the Tachyscope. Muybridge and Anschutz, by their photographic studies of animal locomotion, and the exhibition by projection of the results, undoubtedly brought us appreciably nearer to the realisation of animated photography as we now know it. Muybridge, as is well known, used a series of electrically controlled cameras for recording the phases of movement of a horse passing in front of them.

It appears to have escaped notice that, at the Chester meeting of the

* *Knowledge*, September 1, 1897.

Photographic Convention of the United Kingdom, in June, 1890,* Mr. Friese-Greene introduced his camera for taking a series of photographs in rapid succession. Negatives by its agency were shown in the form of a long ribbon of celluloid impressed with a large number of negatives. The apparatus by which the pictures were to have been shown on the screen was, however, deranged, so that the audience were deprived of the opportunity of witnessing the full effects intended to be reproduced. He exhibited a camera which, he stated, would take a series of negatives at the rate of 600 per minute. He also read a paper dealing with the subject of persistence of vision, and its relation to the production and projection of animated photographs.

But the greatest impetus to animated photography was probably given by Mr. Edison, who, in 1893, produced series of photographs of moving objects on perforated strips of sensitive celluloid films, such as we are now familiar with. The positives from the negatives thus made were converted into endless bands, and these, being electrically driven, and illuminated, were viewed through a magnifying eyepiece, and, as between the eyepiece and the moving band a rotating slotted disc was interposed, which presented a new picture to the eye at each successive revolution, the observer obtained all the impressions of movement in the pictures. The Kinetoscope, as it was called, was exceedingly popular for a time, and there is no doubt that it was the immediate forerunner of the present system of viewing animated photographs on the screen, rather than as translucent films.

Probably the earliest to take advantage of Mr. Edison's obvious hint were Messrs. A. & L. Lumière,† who, on July 11, 1895, gave an exhibition of animated photographs, at the offices of the *Reveu Generale des Sciences*, in Paris, at which the evolutions of cuirassiers, a house on fire, a factory, street scenes, and a dinner party were shown on the screen, and much admired. In view of subsequent developments, it may be interesting to reproduce the brief description of Messrs. Lumière's Cinematograph as it was then given: 'The principal features are a mechanism whereby the film is at rest during illumination, and an arrangement for projecting the images upon a screen so as to be visible to a large meeting. Under these circumstances, fifteen images a second are all that is necessary. The film is at rest for two-thirds of the time of the passage of each image. During the remaining third the film is grasped and pulled forward as far as the next image by a set of teeth attached to a frame, whose motion is governed by a cam, working by a revolving handle. The same apparatus also serves for taking the photographs, and for printing transparencies from the negative film. For this

* The British Journal of Photography, vol. xxxvii., p. 423.

† The British Journal of Photography (Supplement), September 6, 1895, p. 72.

purpose two films are passed over the rollers, the negative and the film to be printed on, and exposure is made for a very short time as each negative image is placed on the field.'

On January 14, 1896, Mr. Birt Acres gave, at the Royal Photographic Society, a demonstration of what he then termed the Kinetic lantern for the projection of animated photographs.* These were taken at the rate of about forty per second, and were projected at the rate of about fifteen per second. The examples included boxers, a review at Kiel by the German Emperor, Epsom Downs, and the Derby, serpentine dancing, breaking waves, &c.

Let it be observed that, in this very brief account of the historical development of animated photography, I have eschewed all mention of Patent Office records, and have not sought to discuss the question of priority in whatever inventions animated photography may rely upon.

III.—ANIMATED PHOTOGRAPHY IN PRACTICE.

From the foregoing exposition of the general principles involved, the reader will, doubtless, easily perceive how they are applied in practice. It all comes to this, that a strip of sensitised celluloid film, varying in length as may be desired from sixty feet to hundreds of feet, and perforated at its edges, is wound down in the focus of the view lens, behind which it is held in register for a fraction of a second. The quicker the exposure is being made, the shorter the rest; but, assuming twenty pictures a second to be taken, then the pause will equal one-fortieth of a second. A rapidly moving shutter acts between the lens and the film, which is obviously obscured for a fraction of a second, during which it moves on, and another portion of the film has arrived in position on the focal plane.

In projecting the positives on to the screen exactly the same principles prevail. Each little picture is given a momentary pause behind the projecting lens, and the light is temporarily, although not appreciably, obscured by the shutter.

The Edison standard gauge film measures about 1½ in. wide, the actual dimensions of the image being about 1⅛ inch by ⅞ths of an inch, the perforations numbering four on each side of the picture; the Lumière film has the same measurements, but has only two perforations, one on each side. Some specially made cameras for taking animated photographs admit of films measuring as much as 3¼ in. wide being used, But the advantages of large pictures are not, it may be supposed, universally admitted.

The operation of taking the photographs after a little practice is an

* The British Journal of Photography, vol. xlii., January 7, 1896.

extremely simple matter. The camera is set upon a stand, which cannot be too rigid, and, the view or scene having previously been focussed, the exposure is made by winding off the film behind the lens, the rapidity of movement being, of course, governed in the same manner as with ordinary instantaneous photography—that is to say, the factors of lens aperture, speed of emulsion, and rapidity of shutter, are of equal value in the one kind of photography as in the other. The quicker the objects move, the shorter the exposure. It is well to bear in mind that, theoretically at any rate, in this class of work there is a gain in respect of depth of definition, *i.e.* the short focal length of kinematographic lenses clearly having an advantage over longer-focus lenses used in ordinary work. It must also be borne in mind that, as most Cinematograph apparatus is worked by hand, the rapidity of the exposure may be differentiated at will, so that the operator can adapt his exposures to the speed with which the objects in the field of view are moving.

I insert this elementary outline of the method by which animated photographs are taken in order that those readers who are not interested in the theoretical and historical parts of my subject may better understand the way in which the apparatus, described in the next chapter, is manipulated.

IV.—VARIOUS FORMS OF APPARATUS FOR ANIMATED PHOTOGRAPHY.

During the last two years the number of machines for taking and projecting animated photographs, that have been devised in England alone, numbers considerably over a hundred, and many others are imminent. Not only would it be out of place on my part to institute comparison between any of these machines, but it is also clear that to attempt a description of an appreciable number of them would be a somewhat heavy and monotonous task. As typical, however, of some of the varieties of mechanical means employed in the construction of apparatus designed for animated photography, I append brief descriptions of Messrs. Lumière's, Mr. Acres', and Mr. Demeny's systems. These have come under my own observation, and for that reason are perhaps fittingly selected for mention.

Messrs. Lumière's.

The band of film follows the same path, whether it be a sensitive band for making a negative or a positive band used for projection; in the latter case the back of the apparatus is removed, and a strong beam of light is thrown upon the band.

Only one description is, therefore, necessary to make both functions of the apparatus understood, either for photographing or projecting.

The band of film enclosed in B (figs. 1 and 2) is fifteen metres long

and three centimetres wide; it is perforated near both edges with equidistant holes situated at the extremity of each image; the pictures taken at intervals of one-fifteenth of a second are exactly similar. that is to say, if two pictures be superposed, those parts representing stationary objects will exactly coincide, and the parts representing moving objects

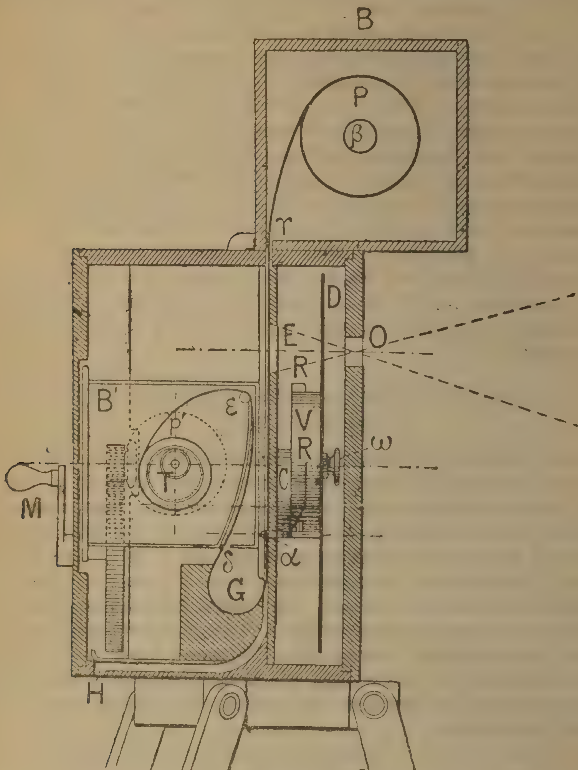


FIG. 1.

will be so situate that they represent the change that has occurred by movement in the interval between the exposures.

This band, P, rolled on a spool (figs. 1 and 2), passes through an opening, y, descends vertically, then passes an aperture, E, in front of the lens situated at O; thence it goes into the recess, G, to pass upwards

over a small rod, E, to be carried on to a spool, P′, rotating on the axis, T.

The handle, M, turned by hand, rotates the spool by a system of cogs, and at the same time turns the arbor, *w*, of an eccentric, C (shown alone, fig. 3), and imparts a go-and-return movement to the frame, L, vertically.

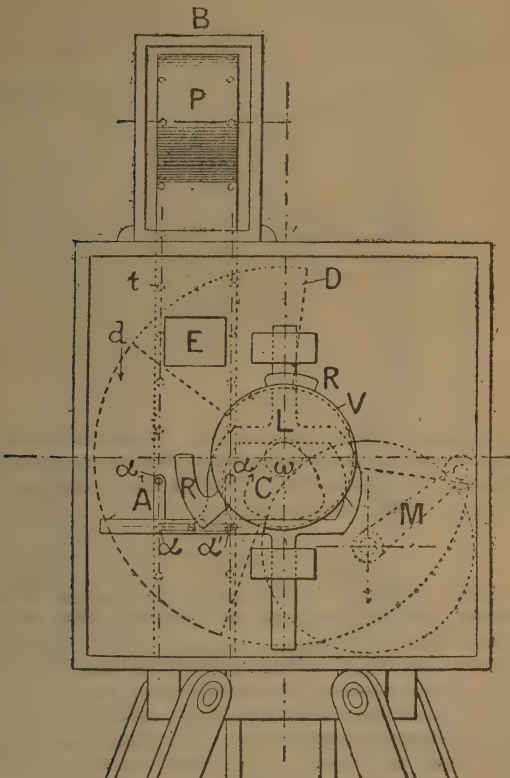


FIG. 2

From the form of this eccentric it will be seen that a regularly increasing speed is imparted to the frame, and that it decreases in like manner, and that there is a rest at each end of the track. This rest is necessary to allow two small hooks, X and A′, carried by the frame, to

pass through, and return from, the holes along the edges of the band. The hooks are attached to the springs, A and C; two inclined planes, B, upon which they slide, remove them from the film when the frame, L, is at the lower extremity of its path, and they allow them to approach and

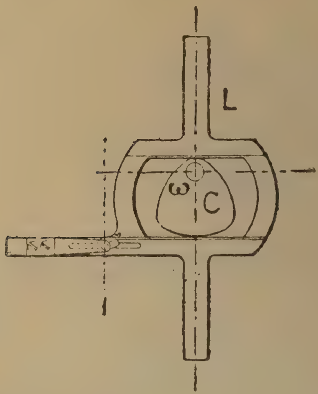


FIG. 3.

engage with the holes when the frame is up. It follows that the band is drawn along the path of the frame in equal sections, and that it remains stationary whilst the frame returns. The length of the picture is, therefore, exactly that of the path of the frame.

MR. BIRT ACRES'.

This system consists more particularly in so arranging the apparatus as to permit of the film being clamped for the period necessary for exposure, projection, or viewing.

A continuous sheet of film is drawn by feeding wheels off a roller by means of two pin wheels taking into perforations made at the edges of the film. It is caused to pass behind the lens, and is clamped there for the short period necessary for exposure. The clamping is effected by an open frame pressed against the film by a cam turned by gear from the axis of the shutter, which is turned by hand or otherwise.

During the time the film is so clamped, the pin wheels still revolving would cause undue strain on the film. This is obviated by causing the film between the clamping frame and the pin wheels to be deflected out of the straight line by a roller acted on by a spring. Whilst the film is travelling this spring deflects the film, but, whilst the film is clamped,

the spring yields, and the pin wheels continuing to revolve take up the slack. Immediately the clamp is released the spring again acts on the roller, causing the film to be deflected as before. The film is then wound on to a second roller.

A is the objective tube, behind which is mounted the disc shutter, *f*, which is caused to revolve by hand or otherwise, driving by any suitable gear a cam, *e*, and pin wheels, c c^1, over which passes the continuous film, *a*, drawn from one spring roller, *b*, and wound on another, b^1.

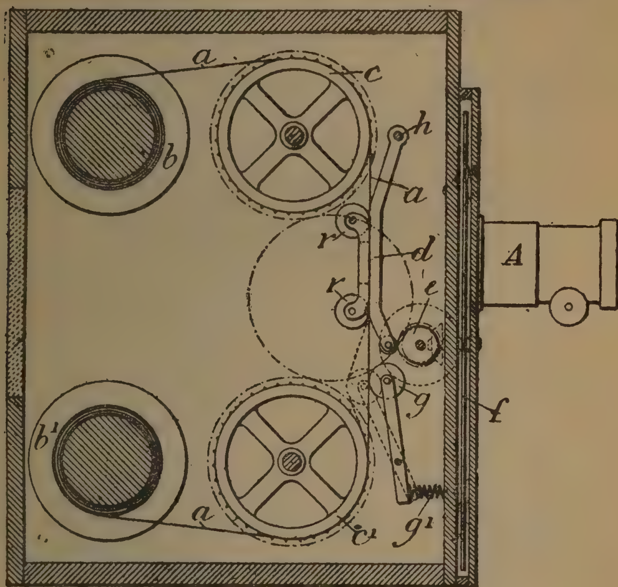


FIG. 4.

The film passes between a pair of rollers, *r*, and the face of a lever, *d*, which is pivoted at *h*, and is alternately pressed by the cam, *e*, against the film clamping it and holding it stationary, and releasing it so as to allow it to move onwards. The pin wheels, c c^1, which are geared together, are so set in the first instance as to leave between them a certain amount of slack of the film, which is taken up by the roller, *g*, urged by a spring, g^1, causing a bend of the film. As the wheels go on while the film is clamped, the wheel, *c*, delivers slack, and the roller, *g*, yields, allowing the wheel, c^1, to take up the slack of the bend.

THE DEMENY CHRONO-PHOTOGRAPH.

The Demeny instrument takes and projects pictures, each of which gives an image having an area four times greater than animated photographs of the usual size.

The illustration shows the band of pictures in process of being wound off.

The bobbin upon which the pellicular band has been previously rolled by the aid of a winder is placed upon a fixed axis, and a friction roller

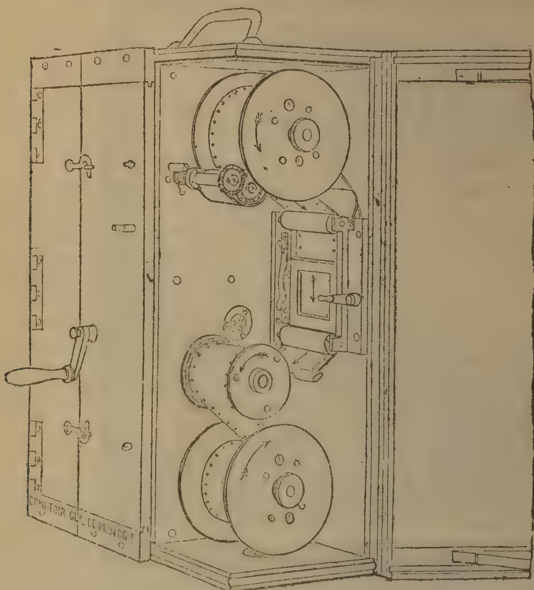


FIG. 5.

drawer composed of a cylinder covered with an indiarubber casing and driven by a gearing placed in the interior of the apparatus, unrolls a given quantity of the pellicular band. This portion of the band engages itself between a guide and a friction roller along a passage lined with velvet, in which is found a rubber frame placed opposite the window, and presenting an identical aperture to that forming the opening of this window.

This rubber frame, lined with with velvet, is movable round a joint

adapted to one of its sides, and, when the film has passed, the frame is applied upon it, and it keeps it in gentle and continuous pressure by clasping in the spring wedge.

After having passed under the frame, the film engages itself *under* a friction roller, then also under a cam, then it is passed *upon* the dented cylinder, wherefrom it finally rolls itself upon the receptor bobbin previously placed upon the drawing axis.

The descriptions of the three instruments here referred to may not apply in all respects to the very latest productions of their respective makers, inasmuch as improvements are constantly being made in this kind of apparatus, but in the main they are probably correct. In the section of this ALMANAC which is devoted to 'Recent Novelties in Apparatus' other cameras for animated photography are also mentioned.

V.—THE BIOGRAPH.

Considerable success in this country has attended the exhibition of animated photographs, on a larger scale than usual, by the Biograph, the invention of an American, Mr. Casler. There are certain features about the method of obtaining and projecting the photographs with this machine that are sure to be interesting, and I therefore give the following particulars, for which I am indebted to an article in the *Scientific American*, here much condensed: The camera frame is mounted by means of three adjustable legs upon a triangular turn-table, which may be placed upon any suitable support. Upon the top of the frame is bolted a two-horse-power electric motor, which is driven by a set of storage batteries. The combination of the turn-table with the vertical adjustment before mentioned enables the camera to be shifted so as to take in the required field. In the front end of the camera is fixed a lens, capable of gathering a great flood of light and producing an image of exceedingly clear detail. Above this lens, on the front face of the camera, is fixed a finder, which gives the same sized image as the main lens. Inside the camera is a strip of film two and three-quarter inches wide, and about 160 feet in length which is wound upon a small pulley or drum. The length of the film varies for different subjects, and, in the case of a prolonged scene, it may extend to several thousands of feet.

The film is led through a series of rollers and caused to pass directly behind the lens of the camera, and finally is wound upon a second drum. The object of the rollers is to cause the film to pass behind the lens with an intermittent instead of a continuous motion. At ordinary speeds this would seem to be a matter of simple accomplishment; but, when we remember that impressions are taken at the rate of forty a second, and that the film, which is running at the

rate of from seven to eight feet a second, has to be stopped and started with equal frequency, it can be understood that the problem was no easy

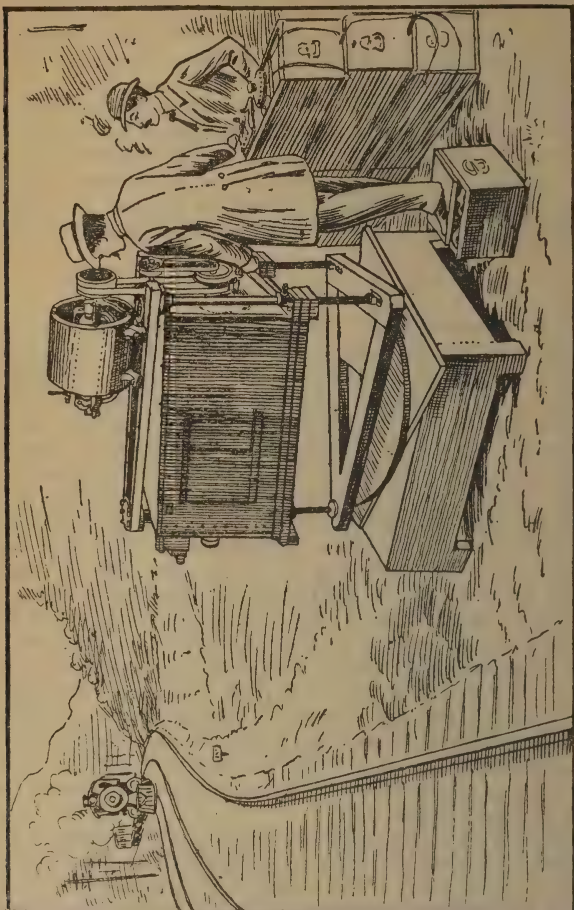


FIG. 6.

one to solve. The film comes to a rest as the shutter opens, a phase or image is deposited, and the film starts again as the shutter closes. The impressions vary in actual exposure between one-hundredth and one

four-hundredth of a second. While the ordinary speed is forty a second, the Biograph can take equally good pictures at the rate of one hundred per second if it is necessary. The higher speed would be used in photographing the flight of a projectile or any object that was in extremely rapid motion.

The mechanism within the cabinet is driven by belting from the motor above mentioned, and the speed of the motor is controlled with great nicety by means of a resistance box, which is shown in the engraving mounted upon the storage batteries. The apparatus is represented (fig. 6) in the act of photographing the 'Pennsylvania Limited' while it was running at the rate of about sixty mile an hour. The Biograph is set up at the side of the tracks upon a solid platform; the stretch of track is properly focussed by the operator, and at the moment that the train comes into sight the current is turned on, the speed being regulated through the resistance box, as explained. By the time the last car of the train has flashed by, 160 feet of film has streamed past the lens, received its 1000 impressions, and been wound with its precious record upon the receiving spool.

The Biograph for projection purposes is similar in its general appearance and construction to the apparatus for taking the photographs. There is a similar arrangement of rollers and mechanism for controlling the movement of the film, and the machine is driven, as before, by an electric motor, and controlled by a resistance box. The chief difference observable in the interior of the Biograph for projection, as compared with the camera, is that the former contains a hand-regulated arc lamp of 5000 candle power, which is placed behind the lens. When a subject is to be thrown upon the screen, a spool containing the positive film is placed in the cabinet, and run with an intermittent motion through the controlling rollers, down between the lamp and the lens, and finally wound upon a receiving spool. In order to ensure that the best effect shall be secured, it is necessary to run the film at the same speed at which it was taken—a result which is obtained by the use of a tachometer. The whole apparatus and the operator are enclosed in a cabinet which is located at the back of the entertainment hall, above the heads of the audience. A hole is cut in the cabinet for the lens, and there is a window for the operator.

VI.—DEVELOPMENT.

Upon the subject of the development of the negative and positive films it is hardly necessary to speak in detail. A reference to Chapter III. shows how, in the Lumière system, the camera used for taking the negatives is also employed for exposing them in contact with the film upon which the positive is made.

A somewhat more elaborate system for employment on a large scale

is due to Mr. Jenkins, of New York, whose method is described in the *Scientific American.*

It consists of reels supported on suitable upright standards holding respectively the sensitive ribbon film and the negative film. The film from the negative supply reel is carried along over the sensitive film reel, and both pass in contact, in continuous motion, under an exposing chamber illuminated by white light, either incandescent electric light or a Welsbach gas light, thence over the toothed sprocket driving wheel to the winding reels, the exposed film being wound first. It will be noticed that the reels are interchangeable, hence, to make duplicate copies, it is

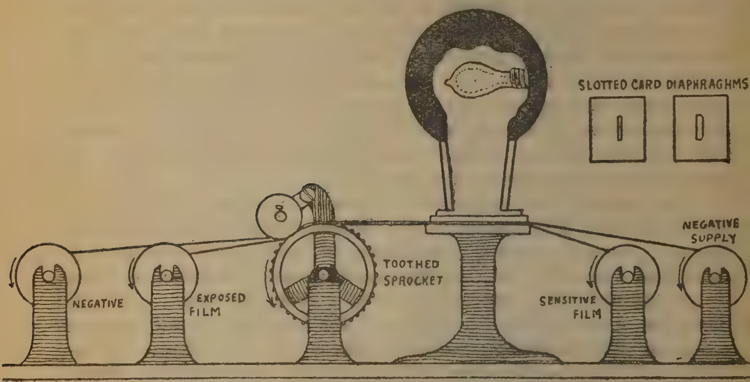


Fig. 7.—Ribbon photography—diagram of the printing device.

only necessary to remove the negative spool from the winding-up end to the supply spool standard of the apparatus and begin over again. The perforations in the edges of the film are of specially square shape, and give the square sprocket teeth of the propelling pulley a better pull on the film. The teeth pass through the perforations of both films, causing both to move exactly the same, and at all times to keep in perfect register. The speed of the film, passing under the exposing chamber, must be uniform, and this is obtained by propelling the sprocket wheel by an electric motor or by a spring motor. The electric motor is behind the light chamber. The axle of the motor has worm gear operating a cog wheel on the main shaft. A V-shaped elastic band holds the frame (in which is a ground glass) in contact with the films, producing a sort of tension on the film. To the left of the light chamber is a supplementary tension, adjusted by screw nuts.

Referring to the above illustration, there will be seen two slotted

diaphragm cards. These are placed over the ground glass just mentioned, at the bottom of the light chamber, and are for the purpose of regulating the amount of light that acts on the negative. If the negative film, as a whole, should be thin, then the card with the narrow slot is used, which allows a shorter exposure to be made, as the negative and film are passed under it. If the negative is full of density, then the narrow card is removed and the wider-slotted card substituted, which allows a larger volume of light to act upon the negative film. The exposed film is wound around large open reels from its spool, and developed by passing through troughs of developer solutions.

The necessity of providing apparatus to quickly reproduce positive impressions from the negative ribbon films is one of the reasons why this simple device was invented, and its novelty consists in the fact that the film moves continuously under a uniform source of light without any intermittent motion or the use of shutters.

Whatever the mechanical details of the particular system of printing employed may be, it is obvious that the main principle of passing the negative and the positive film in intimate contact before a constant light at a uniform rate of speed cannot be departed from in practice.

The actual method of development of negative and positive is extremely simple. I believe that the plan mostly favoured is to wind the film round a revolving drum, which passes through the developing solution. The only plan I have actually seen in operation is that adopted by Mr. Birt Acres. He uses a rectangular frame, the top and bottom bars of which each have a row of small wooden beads. The film is wound taut round this frame, the wooden beads engaging in the perforations. The ends of the film being secured to the frame, the whole thing is placed in a vertical bath containing the developer, and is fixed and washed in similar vessels. This appears to be a simple and economical way of working, especially on a small scale.

VII.—SOME DEFECTS OF ANIMATED PHOTOGRAPHS.

Bearing in mind that the exigencies of projecting animated photographs frequently demand their magnification by hundreds of diameters, the prominent appearance of light and dark streaks, splashes and lines in the pictures can hardly be wondered at. Apparently we are far from the time when these pictures will have all the purity and brilliancy of a first-class lantern transparency; but there are distinct signs of improvement, and it may be conjectured that, when the photography of the subject receives a little more attention in detail, marked advances in the technical qualities will be made.

The chief defect, however, from which projected animated photographs suffer is the 'flicker' of the image on the screen. Numerous are

the theories put forward to account for this unmistakeable drawback. The alternation of light and shadow caused by the use of the shutter; the inaccurate perforation of the film and its consequent inability to engage in the sprockets; non-registration of the pictures as they pass the projecting lens and unsteadiness of the apparatus in taking and showing the pictures are among the explanations advanced.

There are many ingenious mechanicians at work to overcome this defect; but it is as well not to be too sanguine that the much-needed improvement will be universally realised very quickly. I do not exaggerate in saying that, during the last year, I have been made the recipient of the confidences of at least a dozen persons who have brought the Kinematograph to perfection; some of the machines have not yet seen the light, others have, but they have fallen short of expectations.

There is another point which it is permissible to suggest should receive greater attention, and that is the use of the lens under such conditions as will ensure the very highest degree of definition in the negative. The objective usually employed for the purpose is one of the portrait type, working at an aperture of f-3 approximately, with a focus of about $2\frac{1}{2}$ inches. The covering power of the lens is obviously more than equal to the requirements demanded of it; but a little care in the selection of a lens giving the best obtainable definition is not thrown away.

With the exception of a Biograph noticed in a previous chapter, which is actuated by an electric motor, hand power is exerted in taking and projecting the pictures, and, on the whole, is most suitable, as the convenience of differentiation of speed is obtained.

For the purpose of minimising the visibility of the flicker, Mons. Gaumont, of Paris, has introduced a little instrument which he calls La Grille. It resembles in construction a fan, the upper portion of which has a series of transparent openings through which the spectator looks at the pictures on the screen.

So far the use of a shutter in taking and projecting is generally recognised. Mr. Jenkins, however, whom I have already quoted, considers that to use a shutter is a detriment, as it causes an enormous loss of illumination—in the Kinetoscope over 300 per cent. [probably seventy-five per cent. is meant.—Ed.]; and to move any part of the mechanism intermittently is prohibitory in devices intended to move so rapidly as is necessary in this class of apparatus, viz., 1800 repetitions per minute.

He claims to have devised an apparatus which dispenses with a shutter—a direction in which several English inventors have been working, with what success I do not know. Attempts have also been made to avoid giving the film an intermittent motion; but the results, I believe, are not satisfactory, the continuous movement of the ribbon giving

the pictures what is known as a 'rainy' effect. This applies to projection, and presumably, in taking the photographs on continuously moving films the same defect would characterise the negative. Theory demands intermittent motion, as without it is difficult to conceive that a series of distinct and disconnected photographs can be presented to the retina.

VIII.—VIEWING ANIMATED PHOTOGRAPHS IN BOOK FORM.

One of the inevitable developments of animated photography is that the pictures should be reproduced on paper in book form, and the effect of motion obtained by viewing them as they are rapidly pressed forward one after another by the pressure of the finger. This idea has been availed of for selling penny books of 'living photographs' as toys,

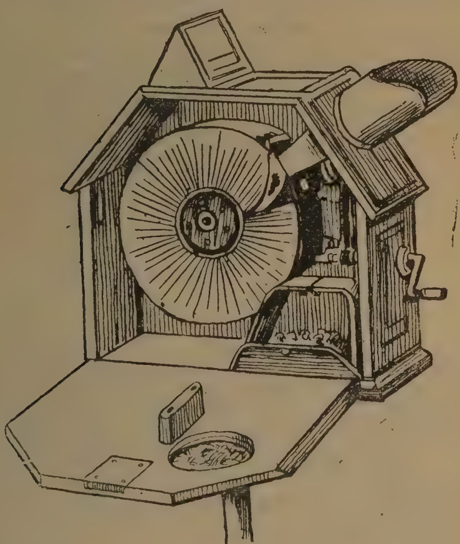


FIG. 8.

obviously suggested by the little books of drawn figures which were popular thirty years ago. More elaborate and useful is the device for enclosing a book of enlarged photographs in a cabinet with an eyepiece through which, as the photographs are released by pressure, the full effect of movement may be obtained. I append descriptions of two inventions

for this purpose, the one, the Mutoscope,* by Mr. Casler, of New York; the other, the Kinora, by Messrs. Lumière. The latter, it will be observed, is adaptable for 'automatic' use, a phase of animated photography that is practically a revival of the Kinetoscope.

The Mutoscope (fig. 8).

In this machine the bulk, the complicated mechanism, and the motor of the Biograph are replaced by a simple, box-like apparatus, no larger than the cover of a sewing machine. The enlarged pictures, six by four inches in height, are mounted in close consecutive order around a cylinder, and stand out like the leaves of a book. Each picture is momentarily held in front of the lens by the action of a stop attached to the roof of the box, which allows the pictures to slip by in much the same way as the thumb is used upon the leaves of a book.

The Kinora.

The pictures are cemented on cards, M, or other elastic opaque supports, to which a curved form is given, the picture occupying the concave side. These cards are then mounted in the order of succession of the pictures on a shaft, A, around which they radiate in every direc-

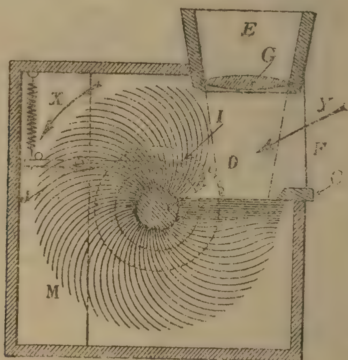


Fig. 9.

tion, being firmly fixed at their base by the pressure of two discs, BB, or by other suitable arrangement.

If the wheel thus formed is caused to turn in the direction of the arrow, X (fig. 9), and at the same time a stop, C, entering slightly the circumference of the wheel, is fixed slightly above the centre, the cards detained by the stop will be straightened out, and become flat and nearly

* *Scientific American.*

radial, as shown in fig. 10, at the same time leaving an empty segment, D.

The rotary motion continuing, the cards thus stopped will escape one after the other at regular intervals, and will rapidly traverse the empty segment, again assuming their original curved form consequent on their elasticity. The distance to which the stop, C, enters is regulated so that the empty segment, D, shall allow the picture on the last detained card to be viewed through the opening, E, which picture is illuminated by daylight or by artificial light entering in the direction of the arrow, Y, through the side opening, F, of the box containing the apparatus.

The observer, looking through the opening, E, will therefore see successively the pictures in a state of complete rest, the successive visions being separated from each other only by the exceedingly small space of time occupied by a card traversing the segment, D. Inasmuch

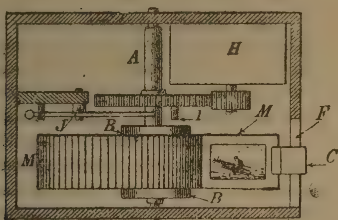


FIG. 10.

as the edge of the card, which is escaping from the stop, C, cannot exactly coincide with the edge of the next card to be detained, the stop, C, can be lowered near to the line passing through the centre of the shaft, A, so as to render this difference so slight that the eye can perceive no lateral movement in the succession of the two pictures.

The back of each card as also the parts not covered by the picture are blackened, in order to avoid all radiation of light during its passage across the field of vision. The opening, E, can be provided with a lens, G, to magnify the pictures, and with any other known arrangement for assisting observation.

The wheel might be formed of flat cards radiating from the centre of the shaft, A, but in such case the stop, C, would curve the pictures at the moment of vision; this is why it is preferred to curve the cards previously, in order that they may be presented flat during observation.

As the wheel makes only one revolution, or part of a revolution, during

the viewing of a scene, it moves at a very moderate speed; it can be put in motion by hand, by intermediate gearing, or, better, by a spring motor placed at H (fig 10).

It will be easy to stop the motor at the end of a scene by means of a stop, J, in position to act against one or several pins, I, conveniently placed on a wheel carried by the shaft, A.

The wheel will be again set in motion by raising the stop, J, which will give a renewed exhibition of the same scene, or will exhibit the following scene on the same wheel. This arrangement enables the apparatus to be readily rendered automatic by the introduction of a piece of money into the box, which piece, having only to liberate the mechanism, stops of itself at the end of the scene.

IX.—STEREOSCOPIC ANIMATED PHOTOGRAPHS.

Whether it is feasible to realise the dream of some inventors to project animated photographs that may be viewed stereoscopically is hard to say; but it has escaped general notice that the veteran mechanician, Mr. F. H. Wenham, to whom photography is under many a recognised obligation, some time ago* narrated some experiments he made, with the idea of imparting stereoscopic relief to Zoetropic pictures. Here is Mr. Wenham's description of his experiments :—

'The description of the arrangement of Mr. Edison calls to my recollection some experiments in this direction made by myself in the year 1852. It then occurred to me that, if the series of figures in the Zoetrope, or wheel of life, were taken photographically and duplicated as in the stereoscope, and both series viewed simultaneously with each eye, that, instead of a mere flat moving diagram, we should obtain the effect of a solid figure in motion. Accordingly, two large circular millboard discs were mounted on spindles rotated in opposite directions by means of a crossed band of common clock chain running on spiked pulleys on the spindles. The next step was to take the photographs. This, being the early days of the collodion process, was a tedious operation, as from eight to ten seconds were required for each exposure. The camera used was a stereoscopic one, giving two pictures simultaneously. Ten pairs of negatives were taken, from which twenty prints were obtained. Ten of these were mounted at equal distances on each of the flat discs for the commencing half of the movement of the figure, and the corresponding ten of the receding one, so that there were twenty pictures on each disc, the first starting from zero, and the last again reverting to the first. In each of the intervals between the pictures a slit was cut for securing a momentary vision of each, and the whole was rotated with the pictures well lighted and facing a looking-glass. The subject selected was a little

* *English Mechanic*, June 7, 1895.

man with a head so bald that it was aptly compared to a bladder of lard; he was seated in a chair in sunlight. Before him was placed a garden vase to represent a mortar; a pestle was extemporised. At the end of this was nailed a lath about fifteen inches long, marked off in ten divisions. In the first position our sitter rested the end of this lath on the bottom of the mortar; a pair of stereoscopic pictures were then taken. Next, one-tenth was sawn off the end of the lath for another picture, and so on through the ten divisions. The finished prints were then carefully spaced and mounted on the two discs. On rotating these before the looking-glass, the effect was extremely grotesque. The whole of the little man's body, while frantically pounding in the mortar, was in a state of quivering and violent motion, and his bald, shining head bobbing up and down gave the whole display such a ludicrous effect as invariably to elicit roars of laughter, and the astonished sitter remarked, 'I never worked like that.' Another set of stereoscopic pictures were produced on a larger scale. A hand saw was marked off in divisions, and side-view pictures on each, of a carpenter sawing a deal on a stool, were taken. This was intended for a public exhibition, but circumstances prevented the arrangement from being completed; and, after all, unless the pictures are very numerous, there is the usual tremulous motion common to all zoetropes, and the subject is scarcely one of much scientific interest. The converse of this is to take a portrait, while the sensitised plate is moved uniformly from a radius during the time of exposure. The result is a horrible smear, having no recognisable likeness; but, if a print from this picture—or, better still, any number of them—is mounted on a rotating disc of similar radius, and, while in rotation, viewed through a small aperture, the effect of the motion is to foreshorten the picture in the direction of the transit, and reproduce it in due proportion.'

I reproduce Mr. Wenham's observations because some aspiring inventor may derive from them a hint as to the point from which the problem of stereoscopic animated photography may be attacked. To me, however, the extract is chiefly interesting from the fact that, over forty-five years ago, Mr. Wenham appears to have attempted the adaptation of photography to zoetropy, and that to him belongs whatever credit may be due for being the first to suggest the combination.

X.—CONCLUSION.

I am obliged, by exigencies of space, not only to leave severa branches of my subject without mention, but to confine my remarks within narrow limits; hence I trust the reader will forgive the somewhat fragmentary nature of these chapters.

As I remarked at the outset, this branch of photography is probably still in the very early stages of development. It has not been altogether

in favour of its progress and perfection that its adaptability for entertainment purposes forced animated photography, practically at its birth, into the hands of those who supply the public with amusement. The sudden demand for films and projection apparatus was not favourable to the production of the best photographs and the means wherewith to make them, and the consequence obviously was, that innumerable pictures were shown all over the country which had many defects.

The problem of providing a noiseless camera and projector, which does not destroy the film at its perforation, and abolishes vibration and flicker in the projected images, is one with which, in all probability, only a highly skilled mechanician can cope. I do not despair of seeing some of the apparatus extant at the present moment (November) much improved upon, and the most cogent reason for my optimism in this regard is that there is just now the keenest competition going on among many skilled mechanical engineers and others to secure a degree of perfection in the working parts of apparatus for animated photography such as has not hitherto been achieved.

Finally, it appears to me this branch of photography is destined to have something more than a transient existence, and that, as an adjunct to the optical lantern, as a means of preserving records of scenes and occurrences, and for scientific and entertaining purposes, we have only just commenced to tap its possibilities.

ON COPYING PHOTOGRAPHS.

By G. Watmough Webster, F.C.S., F.R.P.S.

It is just about a quarter of a century since I contributed to the pages of The British Journal of Photography a description of a simple stand or table I had devised for that occasional work that falls to the lot of most professional photographers—the copying or enlarging of old photographs—daguerreotype, glass positive, or paper print. Since then the stand has passed through many stages, and many friends who saw it at the Convention time asked me to send to the Journal a fresh description of the improved pattern, as it seemed to supply a 'long-felt want.' Perhaps I shall do so soon, but at present I want to talk about processes rather than apparatus.

This sort of copying that I am alluding to often forms a very important part of a photographer's income; it is always these 'cheap things, taken for a joke,' at some travelling booth or other such humble studio, that become treasures of untold value, and from which sorrowing relatives wish to have large pictures executed. Then, again, for manufacturing purposes, it often happens that some particular picture has to be reproduced, and there is no negative available; or some engraving, say, has to be copied, and so on; there are a hundred occasions, each with a different motive, but each calling for a good copy. As a matter of course, all self-respecting photographers who have been working for so long a period as I named a moment ago, will say there is nothing like collodion for copying; and, judging by the feeble results obtained by the average 'pro.' when working with ordinary dry plates, the dictum would seem to be justified. I used to say the same thing myself, and silver bath and collodion are up to the present time always available in my enlarging-rooom; but I am willing to own up that I do not always use it for the purpose. We professionals used to smile in a benevolently superior manner at the amateur and his dry plates; but he has turned the tables on us in a very complete manner. Nevertheless, for copying and enlarging, we have stuck to bath and collodion: the question is, 'Are we, even for that purpose, going to abandon it?' Well, we know the process-block maker stuck to collodion through thick and thin; but the dry-plate maker has also stuck to him. Splendid plates are now made, and the result is that many of the block makers find that, when they get to understand the special plate made for their use, they are content to abandon collodion. Similarly in the small way of such occasional work as I am speaking of, it is probable that collodion may, ere long, be quite given up. Personally, I am able to say that, at last, I find I can get results with a 'process plate' quite equal to what I should obtain with collodion; I am quite sure that my younger assistants get even better results with them than they would with collodion.

I advise my readers to try. These plates are very much slower than the ordinary portrait or even landscape plate; but they are quicker than collodion, and with the feeblest original there is not the slightest difficulty in bringing the negatives up to full printing density. And the saving of time and labour is immense.

Then, again, it is always a ticklish matter getting a wet-collodion trans-

parency by contact from an old negative, for example; but with a process plate and a gaslight there is no risk, and the whole process, including developing and fixing, is over in less than five minutes. There is one very special advantage in using these plates—the power of obtaining, through the medium of a transparency and a repeated negative, one that shall be greatly superior in printing capacity to the original. This is a most useful property, for even the most experienced of photographers must occasionally obtain a result which he feels is not up to his usual standard, but which yet he can by reproducing, with the aid of a process plate, improve out of any resemblance to the original negative.

In these columns it is desirable that articles should be brief and to the point, and so I will leave it at that. Let every photographer who uses a collodion wet plate for occasional copying work give process plates a fair trial, and attend to the printed instructions. He will be rather surprised at his first negative when compared with what he would get from an ordinary dry plate.

HOW MANY LITRES ARE THERE IN A GALLON?

By Robert H. Bow, C.E., F.R.S.E.

The description of a gallon has undergone three stages. In the first, it was declared to be so many cubic inches (231, the old wine gallon). Next, by 6 Geo. IV., c. 12, taking effect on 1st January, 1826, two (incompatible) definitions of the imperial gallon were given: it was to contain 277·274 cubic inches, and to hold ten pounds of water at 62°, weighed in air, with the barometer at 30ins.; elaborate but faulty tables, showing comparison with the French measures, &c., were given, founded on the capacity of 277·274 cubic inches. The third stage is that at present in force, in which the cubic contents in inches is not stated; the latest statute is, I believe, 41–42 Vict., chap. 49, which came into force on 1st January, 1879, it re-enacts the definition of the imperial gallon as containing ten pounds weight of water, weighed against brass weights, in air at 62° F., and with the barometer at 30″. But, unfortunately, there is added, as a third schedule, a table of metrical equivalents *uncorrected* for this definition.

Thus the number 4·54346 given of litres in the gallon is derived from dividing 277·274 by 61·0271, the cubic inches in a cubic decimetre—both of which numbers are wrong, the litre is less than a cubic decimetre—the division gives 4·543458, and this is the value printed in the British Pharmacopœia of 1885; this pretence of exactness in giving the relation to six decimals seems rather absurd when an error occurs after the second.

The litre really measures 61·0266 cubic inches, and this quantity of water, at 4° C., weighed in air against a platinum weight, with the barometer at 760m.m., weighs one kilogramme, or 15,432·35 grains; but if one litre of water at 62° be cooled down to 4° C., its weight will be rather less than 15,415·1 grains, and as a first approximation, using that value as a divisor of 10lbs., or 70,000 grains, we get 4·54102, the same value as given by Professor Rankine in 1866, from Professor Miller's data. But when the litre of water at 62° is weighed at 62°, it will be less buoyed up by the warmer air; the value of the small correction, rendered necessary

by this, depends in part on the specific gravity of the counterpoise; if that were very great, we should add nearly 0·014 grain for each cubic inch of water, or 0·854 grain in all; adding nearly three-quarters of a grain we get for the weight 15,415·83, and this gives the result 4·5408; so that we may use 4 541 as a satisfactory approximate value of the number of litres in an imperial gallon.

NOTES FOR COLLODION LANTERN-SLIDE MAKERS.

By W. B. Bolton.

A slight intensification with silver is undoubtedly the best way of finishing off a collodion emulsion lantern slide, and after fixing is the best time to do it; but the difficulty of removing the last traces of hypo renders the operation a very uncertain and risky one. Cyanide, when used of sufficient strength to remove the bromide of silver in decent time, is not altogether satisfactory, and seems to have an injurious action on the finer gradations of the alkaline-developed image, but if used in a comparatively weak form after fixing with hypo, it has no injurious action, and serves the purpose of removing the danger arising from the latter. Every slide, however clean, is brightened by an application of weak iodine, followed by cyanide, and this treatment ensures at once perfect fixation, elimination of the hypo, and safety in intensification.

Sulphocyanide of ammonium may be used instead of hypo, if care be observed, but a second bath should always be employed. Bromide of silver is very soluble in strong or comparatively strong sulphocyanide, but the proportion taken into solution rapidly falls as the strength of the solution decreases. Hence it happens, especially if the bath has been used for any time, that, on washing the plate, a portion of the silver bromide is thrown down, some being washed away, but a portion remains in the film, and is fortunately visible. If the plate be rinsed, and again treated with a fresh and clean solution of sulphocyanide, it may be taken as pretty certain that the second fixing is a complete one. It is a good plan to keep a separate clean solution of sulphocyanide, and, after first fixing and washing the plate, to pour sufficient over it to cover it well, and to return that to the general fixing stock, so as not to contaminate the other.

Silver intensification should never be resorted to directly after the use of an *old* fixing bath, whether of cyanide, hypo, or sulphocyanide. If the fixing solution is charged with silver, some portion of the metal is sure to remain in the films, or its effects will, and the inevitable result will be stains. These may be avoided by the use of clean cyanide or sulphocyanide, especially if preceded by a dose of weak iodine or hydrochloric acid.

Many amateurs object to the use of iodine on account of its expense. as well as the difficulty in dissolving it, and many prefer the ferricyanide clearing formula. This latter may answer very well where intensification is done before fixing, or as a final clearing before drying, but it is not to be recommended before intensification for the same reason that hypo is objectionable. Those, therefore, who want a cheap and efficient

clearer should use bichromate of potash and hydrochloric acid, one ounce of each in a pint of water. This may be kept as a stock solution, and a few drops of it added to a couple of drachms of water when required for use. It is, I think, superior to iodine, as the *white* veil of converted silver is more easily seen and judged. It should be used very weak and cautiously, the application being made two or three or several times alternately with the fixing solution until the effect is obtained, rather than in one operation. The final treatment should be with clean cyanide or sulphocyanide.

A 'single-solution' clearer, the action of which can be directly watched, has its undoubted advantages, but cyanide and iodine, as usually employed, is apt to be uncertain. Here bichromate of potash again proves useful, but this time in conjunction with nitric acid. If equal parts of nitric acid and bichromate be dissolved in twenty parts of water, a stock solution is obtained which can be diluted for use when wanted. The nitric acid attacks the image, forming nitrate; this the bichromate converts into chromate of silver, which is partly dissolved in the solution, and the remainder, if any, washes out. It must be used very cautiously, and the action stopped instantly the lights of the transparency are clear, or a little before. Safety lies in a weak solution.

Many, if not most, workers, now prefer their slides varnished. A very useful varnish, which does not impair the definition as spirit varnishes are apt to, is a solution of shellac in aqueous ammonia, with a little alcohol added, or perhaps some will prefer to omit the alcohol. However, I give my own formula, which consists of—

Bleached lac	1 ounce.
Strong ammonia	2 fluid ounces.
Alcohol	2 ,, ,,
Water, to make	8 ,, ,,

Powder the shellac and digest for some time with the ammonia and alcohol, then place the bottle in a vessel of hot water, and shake occasionally until dissolved; finally make up to eight ounces with water, and filter. Apply either wet or dry; if the former, pour on and off three or four times to remove the surface water.

CURVATURE OF FIELD, ASTIGMATISM, &c., OF PHOTOGRAPHIC LENSES.

By W. K. Burton.

Some couple of years or so ago I wrote a paper to the *Camera Club Journal*, in which I described a simplified method of working out curves of field and of astigmatism for photographic lenses, illustrating the paper with curves worked out for over thirty different kinds of lenses.

In your own introductory communication to last year's British Journal Photographic Almanac you made mention of the paper, stating that it ought to be better known—or something to that effect—I have not the Almanac, or any other photographic publication, to refer to here in the wilds of South Formosa, where the temperature is 97° Far. by a

thermometer on the table where I write—under the shade of a broad temple roof, and perhaps the coolest place within miles.

Of this enough, however; it is for the reading photographic public itself to decide whether it take heed of my paper or not; but there is one thing I think the *buying* photographic public might reasonably demand of opticians, and that is that they should publish, with their advertisements, curves of astigmatism and field, worked out by my own method or any other, as well as the other details, as regards aperture, &c., that they already nearly always do publish.

It may seem that this is too much to ask from opticians—that the publication of such particulars would lead to invidious comparisons—but see how much has already been done that twenty years ago would have been considered too much to expect from opticians—or, at any rate, that opticians considered it too much to volunteer.

I can very well remember when (I think I am not mistaken) *no single optician* stated even the angular aperture of his lenses without stop, or with maximum stop, but only used vague terms, such as 'extra rapidity,' 'extreme rapidity,' and so forth.

I can also remember when, suggesting to one of the then—and still—leading opticians in London, that his rapid symmetricals should have a uniform maximum aperture of f-8, and that smaller stops should bear at least some ratio to the maximum aperture (this was before the suggestion of the universal standard). He replied that it would be simply impossible—that to face merely the correspondence that would be involved would be out of the question. Yet this very optician now gives, in his advertisements, the angular apertures of every lens he makes, and the relative angular apertures or areas of smaller stops. So, in fact, now do all opticians of real eminence, whilst one publishes an elaborate table—a copy of which is pasted to the wall of the room where I do my printing, keep my cameras, lenses, &c.—of the angular aperture of every stop of every lens that he manufactures.

Then, again, what an improvement there has been in the matter of giving us information of the field angle. We used to have vague statements about 'extraordinary wide angle,' 'angle of over 100°,' &c., some not only vague, but wild. Now we quite commonly have of any given lens a statement of the size of plate it will cover with different stops, and finally a statement of the 'circle illuminated' with a 'small stop.' The only defect in connexion with the last-mentioned statement is that it is not generally made clear whether the 'circle illuminated' is that of the utmost limit—that which would be illuminated by a stop of indefinitely small size, or that fully illuminated with the smallest stop actually supplied with the lens. Fully illuminated in the sense that the pencils are not cut down by the mounting of the lens, but are limited by the diaphragm only.

Further still, we now have accurate illustrations of lenses, showing not only the outside form, but showing one half in section. All this information, which the opticians denied us ten to twenty years ago—perhaps from fear of odious comparison—is now freely published; and why not curves of field and of astigmatism? I should think that those firms who turn out lenses most free from these defects would be proud of publishing the curves I suggest, which might conveniently be placed above or below the illustrations of the lenses themselves.

I have nothing to say against the illustrations without the curves, except that they do not give all the information we want. The illustrations give an accurate idea of the general forms of lenses, and of the equality, or want of it, of illumination, and a rough idea of the weight of the instrument; but even the best optical mathematician could not work out further properties of the lenses without information as to the refracting and dispersing properties of each piece of glass used, and then only with much labour.

It may be argued that the average photographer has, even in these days, but a vague idea of the meaning of such terms as 'angular aperture,' 'flatness of field,' 'depth of focus,' &c., that 'astigmatism' conveys nothing definite at all to his mind, and that 'curve of astigmatism' is mere Greek to him. I think this is very far from being the case with the average photographer of the present day, though there are certainly some still sunk in the state of ignorance indicated above. Surely, however, the majority of photographers, who would gain very definite information from curves of the kind described, should not be deprived of the information they wish for the sake of these few ignorami.

VEIL *VERSUS* CLEAR GLASS IN HIGH LIGHTS.

By E. Dockree.

It is frequently stated by those who should know better, when giving a demonstration on lantern slide making, that a perfect slide or a lantern picture nearing perfection should possess 'absolutely clear glass in the high lights;' are these demonstrators really in earnest when they make such a statement? is such a conclusion arrived at by experience?

If they have never done so, and the result is to be brought home to them rather forcibly, it is suggested that a slide be made from the same negative, allowing during development a thin veiling to creep over the picture; project, when finished, the same on to the screen, then try with one possessing clear glass in the high lights, the difference will be most marked, and such information (?) will not emanate again from their lips. Many have never tried this experiment of comparison, or such an assertion they would never make; although, if consideration is given to the matter at all, it stands to reason that, from whatever point of view it is looked at, 'atmosphere' is an abstract quality to be realised by some of the faculties, even though it be in a picture that is being considered.

To make a slide with the said 'high lights' consisting of clear glass, means 'pluck' or 'vim' in the view, but is this a quality always desirable? In very many cases decidedly not; to render a view, &c., thus, shows only too apparently the absence of ordinary aerial qualities, the whole subject having the appearance of existing either in a 'vacuum' or 'rarified air,' neither of which, as far as the camera, &c., has as yet ascertained, exists within many thousands of yards above the earth.

Nature, we are taught, abhors a vacuum, and consequently those endeavouring to render the 'beautiful in nature' in the form of photographic prints on glass should also try to render that soft atmospheric effect always to be appreciated, be it sunshine, gloom, mist, or fog.

Very many slide workers choose or make the wrong class of negative from which to make lantern slides; that giving a good platinum print is the sort to also give a slide in which atmosphere will be self-evident; whereas the 'dense, plucky, full-of-sparkle' negative, so generally admired by the beginner, is the one to give the 'clear glass' result. 'Soft and vigorous' is the quality which should be striven after in negatives intended to make slides from, and should the thin veiling creep over the slide, retain it by all means; be not tempted to fly to the ferridcyanide of potassium and hypo to get rid of it.

We live in atmosphere, and we breathe; let us, by means of the things at our command, render Nature as she is, not pass by as non-existent such a quality as 'atmospheric presence.'

BORING AND TURNING GLASS.

By Procella.

Reference is made in a recent number of the Journal to the very old use of turpentine for lubricating the drill or turning tool when either boring or turning glass. Although turpentine is probably one of the best substances for this purpose, owing to its extreme limpidity, yet it is not at all necessary for the purpose.

I have on more than one occasion bored a hole through a broken glass stopper with only olive oil for the lubricant, the only thing necessary being to watch that the drill did not become dry at the point, which it is more apt to do sooner than with a substance like turpentine. A rat-tail file, turned the wrong way in the hole, at once shivers the stopper into fragments, and the pieces are easily taken out; but, while turpentine is one of the best liquids for the above purpose, I believe it is not generally known that there is another, quite as good, if not even better, for the purpose, and one which is more easily accessible to everyone, and that is paraffin oil. I mention this substance because I have found very few practical men have thought of trying it.

A DEVICE FOR HOLDING PAPER WHEN ENLARGING.

By Arthur Payne, F.C.S.

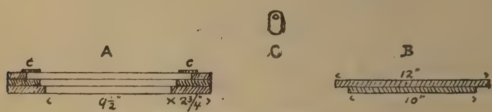
Recently I saw a very neat arrangement, a kind of frame, for holding bromide, or other paper, whilst enlarging; and, as it struck me as being both practical and complete, I thought that it would be a good wrinkle for the Almanac. The frame that I saw was made in cardboard, but I think that it would be better if made of wood. The wood that is sold, ready planed, for fretwork would be the very thing to use, and, if the grain was set to run in the opposite direction when making the frame, it would prevent the work from warping. We will suppose that the frame is to take paper 12×10.

Procure two pieces of fretwood, each piece to be 17 inches by 15 inches, and another piece 15 inches by 17 inches, that will give the grain running across the piece instead of lengthwise. In the middle o

one piece cut a square hole, making it 11½ inches by 9½ inches; in another piece cut a square hole 12 inches by 10 inches; and in the third piece make the opening 14 inches by 12 inches. Fasten these three pieces together so as to form a frame, having a section similar to that shown in the sketch, A, taking care that the pieces are so arranged that the grain of the wood runs in opposite directions.

To form the back or lid, procure another piece of similar wood, 14 inches by 12 inches, and a piece 10 inches by 12 inches, and fasten the smaller of the two in the middle of the larger piece, either by screws or glue, again being careful that the grain of the wood runs in opposite directions. The sketch, B, shows a section of the back when finished.

Four wooden turn-buttons, shown at C, are required; the size of these ought to be about 1½ inches by ¾ inch by ⅜ inch: they will require



a countersunk hole at one end. These are fastened by screws on to the frame, A, one at each side, as shown in the sketch, and are used to hold the back, B, in its place.

When in use, a sheet of bromide paper, 12 × 10, is placed in the frame; the back is then put in and fastened in its place by means of the turn-buckles, C.

The utility of this arrangement lies in the ease with which the bromide paper may be put into its place and removed. By mounting this frame at one end of a baseboard and the enlarging lantern at the other end, once the correct focus is obtained for a particular negative, enlarging may be carried on as quickly as the paper can be put into the frame, exposed, removed, and replaced by another piece of paper.

It will be readily seen that this frame may be constructed to take any size of paper, and, by a little elaboration, it could be so made that, by using various-sized carriers, the same frame would do for any size of paper.

MOUNTING.

By W. Hanson.

The boiling starch, which was in general use about thirty or forty years ago, was an excellent medium for mounting all sizes of photographs with, if made suitably thinner for the larger pictures. It stuck well, and was clean, handy, and easy to work. Moreover, it kept better and longer than the starches now on the market. Perhaps the best substitute for this now lost article is 'Brown and Polson's patent corn flour,' which was recommended for this purpose some years ago by a worker, whose name I do not now remember.

NEGATIVES AND HOW TO MAKE THEM.

By F. Dunsterville.

I think it will be found that, in nearly the whole of the instructions issued by the various manufacturers with their gelatine plates, the only information given as to development is with reference to correct exposures, and perhaps certain modifications necessary in case the plates turned out to be over or under-exposed.

Not one of the plate-makers whose manufacture I have tried (and this includes all the English and some foreign plates) appears to think it in the least necessary to go into details as to modes of development requisite for the production of certain classes of negative for the different printing or enlarging processes, or to give modifications of the standard developer to meet the varying subjects of which we desire to make pictures.

A novice would naturally think that, no matter what the subject may be—a white house in the midst of a lot of dark trees or a bit of open, flat landscape—he must needs make up his developer with exactly the same proportions of pyro, ammonia, and bromide. It would never occur to him that each particular picture would require the several proportions to be increased or diminished.

It is very evident that it would be impossible to give in any reasonable space the necessary details for the innumerable makes of gelatine plates, and I propose therefore to limit myself to the one kind of plate that I have always found most suitable for all climates. I allude to Wratten's Instantaneous. These, I think, come first as existing makes of plates, at any rate in seniority. I brought some out with me in 1878 to India, and still use them regularly, especially when I am going on a tour of 5000 miles or so with twenty dozen plates that have to be exposed on the journey and developed three or four months afterwards two or three thousand miles from the place where they were exposed.

These plates develop well without ice, except perhaps when the thermometer is over 90° in the shade, and then iced water for the developer and fixer is necessary. Some makes of plates, even with iced developers and strong formalin, melt when the air temperature is over 90°.

There are many other makers, of course, whose plates are of the highest quality, and, while making the above remarks about Wratten's plates, it must not be thought I am running down every other plate.

I would first say a few words as to the light in which these plates should be taken out of their packings and put into the dark slides.

If the sun shines on the dark-room windows it will be advisable to have two thicknesses of ruby glass, or one ruby and one deep orange. If the sun does not shine directly on the window, one ruby and one canary medium, or even one deep orange and one canary medium, would be enough. It is, of course, understood that plates are exposed to the light as little as possible.

After dark a candle with two thicknesses of canary medium will answer, or a small kerosine lamp in place of the candle.

The dark slides should be well dusted out after moving the sliding shutters in and out two or three times, and the sensitised surface of the gelatine plates should be gently wiped with a very soft camel's-hair brush or a clean piece of silk velvet. The sensitive surfaces are placed

downwards in the double dark slides, so that, on shutting up the slide, the *backs* of the plates are towards each other.

It is, of course, practically impossible to give the times of exposure necessary for all possible subjects under every possible circumstance, but the following table will give a novice some idea of the exposure needful for certain subjects, *when the sun is shining brightly*, between 9 a.m. and 3 p.m. on any day in the year within a few degrees of latitude 13:—

Using stop.	Sea and sky.	Open Land-scape.	Landscape with dark foreground or street scene.	Outdoor groups or animals.	Portraits in open verandah, using a reflector.	Temple Muntapum, carved pillars inside.	Light interiors. — About	Dark interiors. — Not less than
No. 8 f-11.	$\frac{1}{120}$ sec.	$\frac{1}{30}$ sec.	$\frac{1}{8}$ sec.	1 sec.	$1\frac{1}{2}$ secs.	2 secs.	30 secs.	4 mins.
No. 32 f-22.	$\frac{1}{30}$ sec.	$\frac{1}{8}$ sec.	$\frac{1}{2}$ sec.	4 secs.	6 secs.	8 secs.	2 mins.	16 mins.

For further particulars as to light, &c., I must refer the readers to my exposure tables for the Presidency of Madras, obtainable at Messrs. Oakes & Co's., Mount Road, Madras, the form of which is founded upon some English exposure tables published by Messrs. Cadett & Neall, the celebrated makers of very quick plates.

The developing formula recommended by Messrs. Wratten & Wainwright for their Instantaneous plates (when reduced to its proportions per ounce) works out thus:—

Pyrogallic acid	3 grains.
Bromide of potassium	$\frac{1}{3}$ grain.
Liquor ammoniæ, ·880	$2\frac{1}{2}$ minims.
Water .... to	1 ounce.

I have found the following to be the most satisfactory way of making up stock solutions of the requisite chemicals:—

No. 1.—Pyro.

Pyrogallic acid	1 ounce.
Nitric acid	20 minims.
Distilled water .... to	9 ounces 1 drachm.

Mix the acid and 8 ounces of water together, pour the mixture on the pyro. When dissolved, filter and make up to $9\frac{1}{8}$ ounces with more distilled water.

No. 2—Bromide.

Bromide of potassium..............................	53 grains.
Distilled water .... to	10 ounces.

No. 3.—Ammonia.

Liquor ammoniæ, ·880	1 ounce.
Distilled water .... to	10 ounces.

To make 1 ounce of standard developer, you would have to take

30 minims of No. 1, 30 minims of No. 2, 25 minims of No. 3, and fill up the measure to 1 ounce with clean cold water, and so on in proportion for the number of ounces of developer required. One ounce will develop a quarter-plate, 3 ounces a half-plate, and 4 ounces a whole-plate, and, to make things as easy as possible, I give below the quantities of each chemical required for each of these plates :—

Chemical.	For quarter-plate. 1 ounce.	For 5×4 plate. 2 ounces.	For half-plate. 3 ounces.	For whole-plate. 4 ounces.
No. 1, Pyro......	30 minims	1 drachm	1½ drachms	2 drachms
,, 2, Bromide .	30 ,,	1 ,,	1½ ,,	2 ,,
,, 3, Ammonia	25 ,,	50 minims	1¼ ,,	100 minims
Water ....to	1 ounce	2 ounces	3 ounces	4 ounces

These are the quantities required for making up the developers to the standard recommended by Messrs. Wratten & Wainwright, but I may here mention that I have found it undesirable to use the above quantities of the pyro solution, ample density being obtainable with considerably reduced proportions. The probable cause of this difference is the much higher temperatures in which our work is carried on even in our coolest weather, which is about equal to a warm English summer, or perhaps a shade warmer.

I now come to the various kinds of negatives most suitable for various printing and enlarging processes. These are as follows :—

A. Thin negatives, full of detail, for bromide printing and enlarging by artificial light.

B. Medium negatives, for printing on gelatine or collodio-chloride paper, for enlarging by daylight and for lantern-slide making.

C. Dense negatives, for printing in carbon or platinum or on albumenised paper.

Generally speaking, the most successful way of making good negatives, in my opinion, is to slightly over-expose the plates. By slightly over-exposing, I mean giving fifteen to twenty-five per cent. more than the absolutely correct exposure. Even a greater excess than this is perfectly allowable without in any way endangering the success of the proposed picture, as it can be very easily rectified during development.

By over-exposing your plate you do at least make sure of obtaining the fullest detail in the darkest shadows, while an under-exposed plate is either useless for any purpose or has to be fogged by being forced up with excessive quantities of alkali.

Supposing the subject to be the very common one in India—a roadway, more or less over-arched with the top branches of tall trees, with the sky peeping through here and there, forming the highest lights, while the shady side of the trunks of the trees and the underneath parts of the lower branches contain the deepest shadows—this picture would come under column No. 3 of the exposure table given earlier in this article, 'Landscapes with dark foreground,' and the exposure with stop No. 32 (*f*-22), sun shining brightly, is shown to be one half of a second. This

is about the correct exposure, and would give a good negative with a developer containing at once the full quantities of each chemical—pyro, bromide, and liquor ammoniæ. If, however, there be no wind, and other circumstances (people walking about, &c.) permit, it would be wiser to give three-quarters of a second, or even more, and then there is a greater certainty of all possible detail being got out.

The plate being exposed with a full exposure, the question arises what sort of a negative is wanted—thin, medium, or dense. We will take these in order, and with three plates, each exposed for the same period on the same subject under precisely similar circumstances, we will produce one negative of each of the three kinds.

For Class A, thin negatives, take of the stock solution given above :—

No. 1	20 minims.
,, 2	20 ,,
,, 3	30 ,,
Water ... to	3 ounces.

Pour this over the plate, and watch carefully for the first appearance of the high lights (shade the plate as much as possible from the direct light from the window or lamp). They ought to appear in from twenty twenty-five seconds, and gradually gain density, the detail also increasing at the same time. Do not add any more of No. 3 so long as detail continues to appear, but if it slackens off, then add another 15 minims. When all detail is out, the density will also be sufficient, so pour off the the developer, wash in three or four changes of water, fix in clean hypo 1 ounce to 6 ounces of cold water, wash well and dry.

For Class B, medium negatives, take of

No. 1	30 minims.
,, 2	30 ,,
,, 3	30 ,,
Water ... to	3 ounces.

The procedure is the same in this case, but development will have to be prolonged for a further minute or two to obtain the necessary increase in density.

For Class C, dense negatives, take of

No. 1	60 minims.
,, 2	60 ,,
,, 3	30 ,,
Water ... to	3 ounces.

Development will be still more prolonged in this case, and it will probably be necessary to add at least two and probably three extra quantities of 15 or 20 minims of No. 3 before the required density has been attained.

In adding extra quantities of No. 3, measure them in a minim glass, pour into the developing cup, then return the developing solution from the dish into the cup, so as to well mix up the extra ammonia, and then pour back the reinforced developer over the plate.

A good way of making up stock hypo solution is to take 13 ounces of good clean dry crystals, dissolve it in as little warm water as possible filter it into an ordinary quart whisky bottle, and fill up with clean

water. You have then a solution every ounce of which contains ½ an ounce of hypo. To make a solution of hypo 1 in 6 for the plates now under discussion, take 1 ounce of stock hypo and add 2 ounces of cold water. You then have ½ an ounce of hypo in 3 ounces of water. For larger quantities, take 1 measure of hypo stock solution and 2 similar measures full of cold water. The 'measures' may be ounces, quarter pints, wine glasses, or anything handy.

For prints where 1 in 10 is the proper strength, take 1 measure of stock and add 4, or even 4½, measures of cold water.

The above details show how from certain exposures to make various classes of negative suitable for different printing processes, and now we come to an even more important question, how to make up the developer to meet the many various kinds of subjects the photographer meets with in course of a tour. We may, for sake of brevity, class these in something like the following scales:—

1. Flat landscapes, void of contrasts.
2. Subjects full of contrasts, such as a white house, temple, or tomb framed in a mass of dark foliage.

In either case I chould recommend the same slight percentage o over-exposure previously referred to.

If the subject be a flat landscape or other view void of contrast, the developer should be made up of—

No. 1		60 minims,
,, 2		75 ,,
,, 3		30 ,,
Water	to	3 ounces,

adding 20 to 30 more minims of No. 3 after all detail is out.

In the case of No. 2, subjects full of contrasts, the developer may be—

No. 1		15 minims,
,, 2		10 ,,
,, 3		40 ,,
Water	to	3 ounces,

adding a little more No. 3 if the details in the shadows do not show pretty quickly. The object is to get out the details before too much density has arrived.

CONTACT COPIES OF LANTERN SLIDES WITHOUT UNBINDING —REVERSING NEGATIVES.

By F. H. Glew.

It is sometimes a convenience to be able to copy lantern slides without removing the cover glasses, as the thickness of the cover glass makes it impossible to get sharp contact negatives, and the only alternative is to copy in the camera, which is a much more tedious operation.

By the following process any number of lantern slides, &c., may be copied at one exposure, and the thickness of the cover glass may be disregarded; the secret is to use a point of light as the illuminating agent. The most convenient source of light is a small four-volt electric lamp, and

if this is arranged two or three feet away from the slides during exposure the copies will be absolutely sharp, even the finest engraving lines.

Proceed as follows: Say twenty slides are to be copied, arrange twenty lantern plates, face up, on the dark-room table, five deep and four broad; place a slide on each plate; now fix a tripod over the lot, with electric lamp projecting sideways, and turn on current for two or three minutes—the lamp must be firmly fixed. For those who have not electric light, a small benzoline vapour lamp, turned low, answers nearly as well—of course, it must be held sideways and a little on one side.

All printing from glass to glass is better done by the same method, as two glass surfaces cannot fit perfectly—in fact, all printing should be done with a point of light as the source; and the method has many advantages, even over copying with a lens, for all errors of refraction are avoided.

Reversed negatives are easily produced by this process.

For working with daylight a light tight packing-case may be used, with a small hole in the top, about one-eighth of an inch in diameter. After arranging the plates and objects, the whole can be carried out of doors, so that the hole may receive diffused light from the sky.

NOTES ON THE WORKING OF GELATINO-CHLORIDE P.O.P.

By J. Barker.

In spite of all that has been written upon the subject of gelatino-chloride printing-out paper, some workers still appear to find difficulties arise when using it. One worker finds that his prints fade, another gets double tones, whilst yet another cannot get his prints to tone at all, and so on; but it does not seem to occur to any of them that the fault is in themselves, and not in the paper.

Now, an equal number of difficulties arose with some workers when they were using albumenised paper, so that there is nothing unusual in this, and the following remarks are offered in the hope that they may be of assistance to those concerned.

One case that came under my notice, in which the prints were not only afflicted with double tones and so-called fading, but also with a crop of spots, will serve to illustrate how these difficulties may arise. The method of procedure in the preparation of these prints was to commence by washing them in two changes of water, and then putting them into the alum bath, after which they were rinsed in two changes of water again, and then toned in an acid sulphocyanide gold bath, after which they were rinsed in one change of water, and then put into the hypo bath to fix.

Now, these prints were insufficiently washed before they were put into the alum bath; also they were insufficiently washed after leaving the alum, and were, therefore, in an acid condition when put into the toning bath, which, moreover, was acid itself, and the one rinsing after toning simply left the prints still acid, in which condition they were put into the hypo bath, thus liberating sulphur, which injures the prints, alters the composition, and therefore the action, of the hypo, which is then unable to dissolve (fix out) all the unaltered organic silver chloride,

and usually leaves a sulphur compound of silver in the print, which sooner or later is sure to discolour.

To those who encounter these difficulties I would suggest that the preliminary washing of their prints should take fifteen minutes, not less than five changes of water being used. That the alum bath be omitted, or, if it be necessary, a thorough washing must be again given after its use, or that a substitute, such as Epsom salts, be tried in place of the alum, followed, of course, by washing. That about eight drops of a saturated solution of the best English borax (Howard's) be added to each eight ounces of the Ilford Company's formula for the sulphocyanide gold toning bath. Avoid combined baths, as it is practically impossible to ensure that the fixing and toning shall both take exactly the same time, and, unless this is the case, it is obvious that either the fixing or the toning must be imperfect. We are told that the combined bath is quite safe, as, even if sulphur compounds of silver are formed, they are permanent. Of course, this is so, and it is this permanence in the wrong place which causes the discolouration. Finally, use only the best English hypo, and do not wash too long. This, of course, merely touches the fringe of the subject, as so much has yet to be said, but may help to clear away a few of the difficulties found by some workers.

COPYING.

By W. H. Wheeler.

I lately read a piece of advice, as to copying, not to use a lens covering a much larger plate than required, because such a lens is very likely also to admit more *light* into the camera than required, tending, of course, towards fog and haze. Holding, however, as I do, that good copying requires a full exposure and a small stop, and that it profits even more than direct photography by such exquisite optical definition as obtains in the central part of the image formed by one's very best lens (the largest and best being usually capable of covering much more than generally required for copying)—remembering, too, that a long-focus lens gives more equal illumination—I have long made a point of using, for most of my copying, one very large and fine portrait lens by A. Ross, which, especially when well stopped down, defines so excellently, that to focus it is a continual joy. This lens, when used for copying, would perhaps cover, say, 24×18, and is, therefore, very open to the objection I refer to. It thus became necessary to find some efficient means of excluding from lens and camera all light except that absolutely needed as coming from the object itself, however small might be the plate to be used; and, as I have never heard of my plan being used by any one else, I have thought it might be worth while to describe it.

I made a rough cylinder of common strawboard to slide over the lens, having a cap of cardboard, in which a rectangular aperture was cut of the same shape as the plate—say, for a 10×8 plate, an aperture $2\frac{1}{2}$ by 2 inches, the proportion being thus as one to four. This capped cylinder, when adjusted to a distance in *front* of the stop, equal to one-fourth of the distance of the sensitive plate *behind* the stop, *perfectly* intercepts all light except just that required for a 10×8 plate. Practically, by pushing

in a little for a 12×10, or drawing out a little for $8\frac{1}{2} \times 6\frac{1}{2}$ and under, all may be readily made right for these sizes, and for further sizes another cap and aperture may be substituted. The effect of this cap screen is really remarkable for the perfect manner in which stray light is excluded, far more perfectly than by any other means I am acquainted with.

For its adjustment, I should observe that I do not necessarily use the large slide belonging to the long, rough copying camera on which the lens is placed. This is fixed into one side of a small dark room, and always ready for use. But small plates are exposed in small slides going into convenient frames arranged to fit into the back of the large camera. Thus, to verify the adjustment of the rectangular aperture, all that is needed is to take out the focussing screen, and then, applying one eye successively to each corner of the image required, to look at the *stop*. If the adjustment be *perfect*, the stop will just begin to show at each corner a darkening, caused by the edge of the rectangular aperture beginning partly to exclude the light. For practical purposes, however, it is generally sufficient to see that the stop is clear at each of the four corners, for then it is certain that nothing will be cut off from the plate.

This mode of protection I find very valuable with other cameras, &c., when photographing any dull subject situate near a bright light—such as a painting hung between two windows—for by its means the light of such windows may be so wholly cut off by a specially cut aperture that the lens can *see* nothing whatever but the painting itself. And by this means, too, the surface of the lens is perfectly protected from such obliquely directed light as, though too oblique to pass *through* the lens, may yet dull the image by causing an injurious general illumination of its surface. Even with a wide-angle lens used to its full covering power, oblique light may often cause avoidable mischief in this way. And much superfluous direct light, too, must always enter a lens (used without such a screen), which has, of course, to cover a circle whose diameter is equal to the diagonal of the plate; whereas by this means light can be limited to the inscribed rectangle corresponding to the actual plate exposed.

PHOTOGRAPHY IN THE TROPICS.

By Rev. J. W. Fall, M.A.

Photography in the tropics is by no means so easy as in the temperate zone. The intense heat, the often steaming moisture, the distance from the dealer's shop, with its supply for every conceivable need, the unworkability of some processes in anything but a moderate temperature; all these make an aspiring photographer's experiences anything but always equal, and render them often exceedingly trying.

But there are now so many votaries of the art either resident not far north or south of the equator, or passing through the equatorial regions, who, as the saying is, 'go in for photography,' that a few words out of an experience of a number of years in the East may be acceptable.

And, first, with regard to the apparatus to be used. The best modern apparatus, made by one of the best makers, with all its joints well screwed, is, with ordinary care, as good for the tropics as for England. Provided the

wood is well seasoned, and the corners are not fixed with glue, no brass binding is necessary. This is useful only in the case of some of the very cheap forms of apparatus with which the photographic craze of the last few years has flooded the market. Again, weight need not be considered. In England, where, as a rule, a man carries his own apparatus, the cry is for light articles; but in the East, where few Europeans could carry anything much in the way of a load under the 'vertical rays of a tropic sun,' and where a coolie to carry everything for you will often cost no more than sixpence a day, a few pounds more or less need not be considered. Indeed, it is probably better in choosing an apparatus to err on the side of weight than of lightness. The camera will be better made and will last longer.

In using the apparatus, either the early morning hours, before 7.30 or 8 o'clock, or the afternoon hours, between 3.30 and sunset, between 6 and 6.30, must be taken advantage of. And this for two reasons. The heat of the middle day drives most Europeans who are not forced to be out to the shelter of their bungalows or offices, and the slanting rays, before and after the sun has attained its full elevation, are most successful for pictorial photography. In a country where, according to the saying of one Indian language, midday is the hour when you stand on your own head—that is, when your shadow is all beneath your feet—breadth will not, as a rule, be obtained except at the hours named.

Again, as to exposure. It is often thought that, because the light is more brilliant than in England, the exposures will be shorter. Experience says that generally it is the reverse of this. Exposure in full sunlight is often half as long again at least as would be necessary in a similar picture with full sunlight in England. The reason seems to be that the intensity of the light rays obliterates detail both in the lights and in the shadows. The lights are a glare requiring longer exposure to bring out detail, and the shadows are often as black as midnight. My experience with the hand camera is that, on a sunny summer day in England, the same exposures give far better results than on a similar day in the East.

Again, it must be remembered that, in figure photography, a dark face requires a longer exposure than a white. But beware of exhibiting a portrait of himself to a native. He will seldom criticise the likeness or artistic merit of the picture. Nine times out of ten he will remark, 'But, sir, the face is very black.' You must, to please him, give such exposure and treatment to your plate as will render the chocolate hue of the Hindu as fair as the pallor of the European.

I have never, except on one occasion, when I was stoned by a mob, and had to flee in order to protect my valuable whole-plate camera, found a native crowd other than quite friendly. They do not stick themselves into the most prominent part of a picture with an air of 'I've as much right here as you,' but are generally willing to obey a courteously worded request to move on.

Nothing too strong can be said as to the care necessary to preserve plates from destruction by damp. This all-pervading dampness in most countries near the equator is a terrible enemy. Whole batches of plates will go, and no ordinary precautions will save them. If a man can afford it, every one-dozen box of plates should be sent out in a soldered tin case, which should not be opened until needed for imme

diate use. With such a precaution, probably little danger need be feared.

Then, again, in arranging dark rooms and furnishing them, home-made, with all the necessaries of sink, dishes, lantern, water supply, &c., much might be said; but perhaps what has been already written will be deemed sufficient for the help of some of those many globe-trotters who, as the years go by, visit us in increasing numbers, bearing in their hand the ubiquitous hand camera, and photographing us, our bungalows, our servants, and our surroundings, but who, for some occult reason, so seldom seem able to furnish us with visible proofs of their skill.

L. S. D.

By Frank Miall.

Year after year how often one hears the cry of 'Bad trade, The public seem tired of photography,' 'They want a new style, a new sensation.' Well, is there not one at your door waiting to be let in? and, moreover, one that, if you foster and introduce it to your clients, will meet with every encouragement, and bring you £ *s. d.*

This article is not the philosopher's stone, at whose touch everything will turn to gold, but simply stereoscopic photography, an old and tried friend, who has brought, in the years gone by, good returns of £ *s. d.* to a great many workers: and as it has been, so it can be again, and to any one that will take such pains and care as to produce the best results, there is undoubtedly a successful yield of £ *s. d.*

Interesting subjects for stereoscopic photography are on every hand—outdoor scenes, interiors, groups, animals, portraits—in short, almost every subject that will give a picture with one lens, is greatly enhanced by the use of two, and the results will give pleasure to your customers (to most of whom it will be a novelty), and, what is more pleasing to yourselves, £ *s. d.*

A VISIT TO ROCAMADOUR.

By Lt.-Col. Gubbins.

Some years ago I read, in a periodical, an article headed 'An Albert Dürer Town,' describing a pretty place called 'Rocamadour;' and I arranged to visit it last spring, with my wife, on our way back to Paris from the South of France, where we had been for a trip. We travelled *viâ* Toulouse, and, as the train did not stop at Rocamadour, we had to get out at the previous station, Gramat, and we drove in a kind of omnibus to Rocamadour. The country we passed through, both at the latter part of the train journey and in this vehicle, is most extraordinary; many of the fields looked more like bits of newly macadamised roads than anything else that I can think of, absolutely no earth was visible, and if I had not noticed a partly cut crop of trifolium in one—only stones showing where the crop had been cut—I should never have supposed that these enclosures were ever cultivated. Rocamadour is one of the

most marvellous places imaginable, a narrow valley with a small stream running along the bottom, and steep, almost vertical—in some places, even overhanging—rocky sides, the sanctuary and numbers of chapels perched about, wherever level spots could be found, or made; and a straggling village near the bottom, but above the level part of the valley. It was a pilgrim resort from very early times (St. Amadour has been identified as Zacchæus the publican!) and at one time was, owing to the numbers of offerings made by the pilgrims, a wealthy place. For the protection of its treasures it was fortified, with a wall and gates to the town, and a château or castle on the plateau. The very picturesque gateways and a few bits of the wall still remain, and the château is now used as a clergy house. The sanctuary has been twice destroyed in modern times; first by the Huguenots, and again during the Great Revolution, but has been rebuilt on each occasion. The place is undeniably beautiful, and, notwithstanding the extraordinary stoniness of the ground, wild flowers abound, lilies of the valley in particular. If there were a decently clean hotel, or lodging, to go to, it would soon be well known to artists; but the accommodation is very poor, and there is absolutely *no* drainage. The people of the hotel (?) at which we put up were most willing and obliging, but they did not know what to do. It would seem that the English have not yet invaded the place, and taught them that we like, *and will have*, cleanliness; the inhabitants may be very godly, but they certainly do not possess the next virtue. From what we saw on arrival, we expected to be uncomfortable at night, but the beds were clean. If the place had been more tempting in the matter of accommodation, we should probably have stayed on for some days; but, as it was, we could not stand it, and only spent one whole day there—hardly enough to explore a place in, and take photographs as well. I managed, however, to get a few pretty pictures, though not so many as I wished to, and it was with mingled feelings, of which delight was the strongest, that we left for Paris after a stay of a day and a half.

If any one wishes to 'do' Rocamadour, I think that the best way would be to put up at Toulouse, and go there and back by train in one day, but it makes a very long day of it. Some, of course, there are who don't mind roughing it, but many prefer to keep out of the way of dirt and insanitary arrangements. Whichever way is selected, no one who has ever seen the place will say that it is not worth a visit. We enjoyed our trip immensely, and our pleasure has not been spoilt since by the frequent repetition of the question, 'But where is Rocamadour?'

TESTING LENSES.

By P. Everitt.

It would seem almost impossible to say anything new upon this well-worn theme, but in October last year an article appeared in the *Photographische Correspondenz*, by Herr W. Zschokke, describing a new method he has worked out. It seems to be little known in this country, and a description may be interesting to some of the readers of the Almanac. On a vertical, evenly lit, white surface, a system of horizontal and vertical lines is drawn. These are half a millimetre thick and twenty millimetres apart. Starting with 0 at the centre, each fifth line

is numbered in both directions. The focussing screen of the camera is so inclined that it forms an angle of 75° with the axis of the lens. The camera is so placed that the axis of the lens shall be perpendicular to the test object at o, and that the reduced image shall be one-tenth of the size of the original. If the chemical and visual foci of the lens coincide, and the focus has been accurately adjusted at o, that point will be sharpest in the negative. If they do not coincide, some other point, in front or behind o, will be the sharpest. The depth of definition may also be determined by the number of well-defined lines falling on the plate in its inclined position.

Flatness of Field and Astigmatism.—Assuming the chemical and visual foci coincident, the axis of the inclined focussing screen would be the line along which the points of best definition would be found if the lens had a flat field and no astigmatism. Astigmatism is shown by the difference in sharpness of the horizontal and vertical lines, and it may be measured on the negative by drawing curves through the points of greatest sharpness, first for the horizontal, and then for the vertical lines. The distance between these two curves will be the measure of the astigmatism, and their mean the field of average definition for the lens. Those who wish to study the method further should read Herr Zschokke's article, and another by Herr Loehr in Dr. Eder's *Jahrbuch* for 1897, which both contain the mathematical formulæ, and give a method for expressing the results numerically. Theoretically, in comparing lenses with more than one combination, their relative apertures should be made equal by placing a black mask immediately in front of the front combination; but the practical photographer may disregard this, as he is not likely to use such a mask, and wishes to get the lens most suited to his work.

'BUY GUM' OR THE ADVANTAGES OF THE GUM PROCESS.

By Frank M. Sutcliffe.

Photographers have long wished for a method of printing over which they could have complete control. The existing ways of printing in silver, carbon, and platinum, in the hands of all but the most skilful, give mere mechanical reproductions of a mechanically made negative. The craftsman, aware of this monotony and want of life, tried to add to the negative, by matt varnish, tracing paper, and blacklead, all that which the lens and plate had failed to see and secure; and, further, by sunning down the prints in places, tried to hide all that which the lens and plate had seen and secured which it ought *not* to have done, and which, if it had not been a mere machine, it would *not* have seen. To get rid of objectionable detail, to emphasise a light here and keep down a half-tone there, has been the wish of all photographers who see how seldom the camera tells the truth. The gum process enables the worker to modify his reproductions in the most delightful way. By varying the texture of the paper and the colour used in coating it, no two prints need be exactly alike, while the worker has it in his power to wash up just as much of the print as he wants and no more; even from ordinary negatives very good prints can be made; for instance, from an ordinary negative of a man dressed in nineteenth-century costume there is no need to wash up any more than the face and a mere suggestion of the

figure, the coat buttons, watch-chain, pocket-handkerchief, and all such irritating details can be left untouched and invisible, or they can all be washed quite away.

There is no room here to give any formula. Mr. A. Maskell's book gives all necessary instructions. The writer's first attempts were all failures, and not till a fresh and purer sample of gum was used did the prints do as they were wanted to; thin negatives, which would be thrown away or put aside as only fit for gelatino-bromide prints, can be made to give good prints, and as for expense, when the paper, paint, bichromate, and gum have been bought, there is only the water to pay for; even the expensive smoothing brush is a luxury; small pieces of paper can be evenly coated with only a hog's-hair, that is, when the paper has not too fine a surface; but paper with a fine surface should not be used, for the way which the paint and gum remain in the hollows and can be removed from the ridges of the paper makes this process unique and gives the prints a quality which even platinotypes and carbon prints on rough paper do not possess. As more pigment remains in the hollows of the surface of the paper than on the ridges after coating and smoothing, prints which are not touched with the brush during development, but are left to develop themselves, show a beautiful texture.

As a printing process, the Photo-aquatint, as Mr. Maskell calls it, is well nigh perfect. What more could any one want than perfect control, variety of colour, variety of texture, absolute permanency, and enough difficulty to make it exciting?

SUGGESTIONS FOR TRAVELLING.

By W. J. Warren.

When I received the flattering invitation of the Editor of The British Journal of Photography to contribute something novel and useful to his coming annual, I distinctly appreciated my position, for I realised the truth of that saying of Solomon, or some other equally wise and prosaic philosopher, that there was nothing new under the sun, especially in these days of the photographic press; and I have ultimately resigned myself to an attempt to comply with his latter adjective, so it is upon their claim to utility that the merits of the suggestions I am about to make rest. The photographic mishaps during a considerable amount of wandering by sea and land, the broken and spotted plates, and various other instances of inanimate cussedity dormant in apparatus, and the particularly animate and wideawake cussedity of the average porter, have impressed themselves upon me, as they must have done upon my fellow photographic travellers, and the following suggestions might be, I think, properly described as experience—a cruel but particularly impressive teacher.

Photographers may be divided, as all bodies may, into two classes—those who mean it and those who don't; those who intend to give their holiday up to the pleasurable toil of their hobby, and those who are content to press the button and let a divine providence, or the local chemist, do the rest. I don't say that the results of the former class excel those of the latter; my convictions often lean to the contrary, but it is to the men who mean it that I am writing these suggestions.

Firstly, as to the camera. I am not going to suggest the size or pattern—it would be presumptuous if I did—but I do advise that the glass focussing screen be removed, and a ground celluloid one substituted. I never appreciated this so much as when my own glass deliberately jumped from the camera, and broke itself on the stones of the Sahara, nor have I ever felt much more satisfied than when I drew the celluloid from my camera case and placed it in position. The broken fragments of glass served to reward the guileless children of the desert who were posing for me, and perhaps to-day the diamonds of some dusky Chetma beauty are the envy of the oasis. I have been equally jubilant to find I had a spare tripod screw with me, but even then I have found it worth while tying the one in use to the camera.

Another plan I have adopted is that the plates—I confess to a preference for them in spite of their increasing bulk—should be taken away unopened in their original boxes, and not backed.

Caramel, probably the most efficient medium, has a nasty habit of shelling off, and causing subsequent spots, so I back my plates as I go on just before use, and wipe it off again before repacking.

If the caramel is mixed from time to time with a little methylated spirit, it dries immediately after application, and can be removed subsequently with a damp sponge. For the former purpose I carry a piece of stiff strawboard, with a hole cut in the centre, into which the plate fits exactly. The board is laid on a piece of clean—preferably blotting—paper, the plate placed face downwards in the aperture, the backing applied with another scrap of sponge, and none runs on to the sensitive surface. The exposed plates I place face to face in pairs, and bind the whole into a solid block with gummed paper, and then wrap them in a piece of brown paper—the original wrapping—and replace them in the box, sealing it up in the same way, and endorsing a memorandum of the subjects, &c.

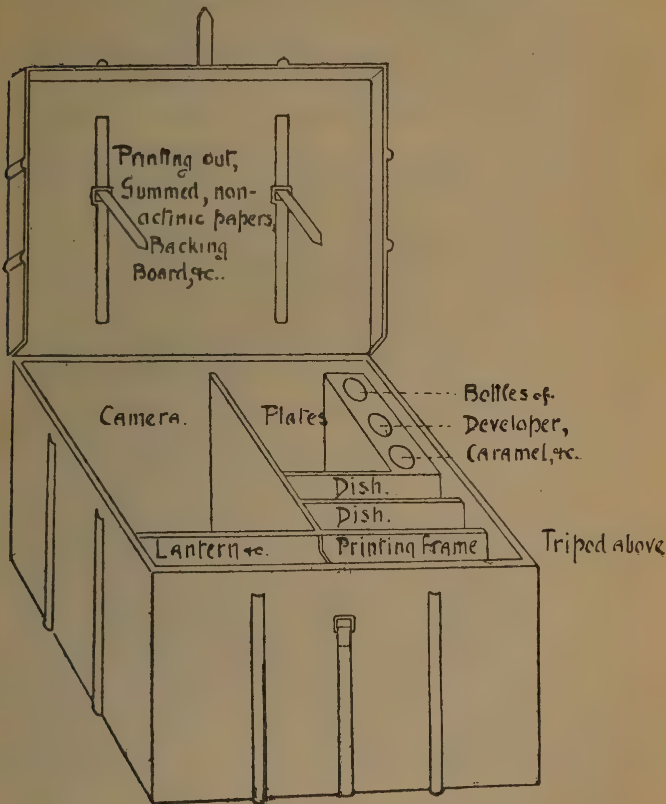
And then, oh, the merits of a scrap of non-actinic gummed paper! It will stop a pinhole in the camera or slides, mend a crack in the lantern, and be found useful in many different ways where the alternative might be serious or impossible.

Finally, as to packing the whole kit. Experiences, such as packets of plates being left behind at a resting place, cascading out of the bag when one withdraws one's pyjamas in a hurry, have convinced me that it is best not to mix them up with one's wardrobe, and so I suggest one special box for everything, and submit the little sketch below.

Its measurements depend, of course, on the size of the outfit, and therefore each of you who adopt my suggestion must work this out for himself, and a good way to ascertain this is to pile up similar articles in the same positions, measure the cube, and, allowing two or three inches for eventualities, obtain the inside measurements.

I hope the sketch is sufficiently clear to explain itself, with the exception, perhaps, of the bottle and measure holders, which are simply three holes, of the diameter and depth required, drilled in a solid piece of wood, which is screwed home in its place. The box itself should be of one-inch clean sound wood, and round it is fastened indiarubber solid tubing to minimise concussions. The interior of the lid has two straps, behind which are packed backing board, sheets of non-actinic paper for blocking a window, and gummed for mending a crack and binding the

plates together. In it there are also stuck a dozen large drawing pins, the use of which will be obvious. The box has a good lock, and also a strap round it to prevent the former straining and to carry it by. On its top should be painted the name of the owner in large letters, and all sorts of fearful warnings and penalties for opening. They haven't much



effect, but they look pretty! The end, too, should have a large initial or sign on it, so that it may be recognised at once and seized on any of those mimic battlefields—the luggage *depôts.*

And, lastly, every available space in one's baggage should be packed with Christian resignation and good temper. Both these will be seriously tested, and I heartily wish they may stand the strain better than mine.

RULE FOR FINDING THE DISTANCE AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS.

By Thomas R. Dallmeyer, F.R.A.S.

Photographers often require to know when an object is so far distant from the lens that it and all the parts of the subject that lie beyond it shall be sharp on the focal plane. This distance depends on (1) the focal length of the lens employed and (2) the intensity or aperture of the diaphragm used; and it is found in terms of *a multiple of the focal length of the lens* by the following rule:—

Divide the focal length in inches by the intensity of the stop used, and multiply by 100.

For example: The lens has a focal length of 6 inches, and is used at an intensity of F. 6. We have, therefore, $6 \div 6 \times 100 = 600$ inches $= 50$ feet.

PHOTO-CYCLING.

By James Stein.

In the end of last year you published in your Journal a paper read before the West London Photographic Society on *Cycling and Photography*, and as since that time numerous slight changes have taken place in both departments, it may be of interest to your readers to call attention to a few of them, especially considering the large number who now practice both. The advantage of combining the two hobbies has now been so often and fully dealt with that it may be accepted as an axiom, and so we may leave that question and plunge into the material question. In the first place, while plates have been steadily improved, there is no question but that films, especially rollable ones, have taken huge strides, this result being due to the animatograph and kindred machines, which have, by increasing the demand, also improved the quality, so that now there is very little to choose between films and plates; indeed, the greatest difference—which, to many, is a serious one—is when the pocket is affected; but it seems to be only a a matter of time till the prices will be the same.

For carrying the plates or cut films double backs still hold their own, and rightly so, for the advantage of being able to take plates of different speeds, and use the one best suited to the subject, is no slight one. At the same time we are inclined to think that they are more prone to produce dust than the bagchangers, and this dust is undoubtedly the cyclist's greatest difficulty. In bagchanging we have an improvement in the Pulman and also in the Yale, which latter is the acme of simplicity.

The tendency during the year has been towards the smaller size of cameras. The new Tit-bit (the quarter of a half-plate) gives a size we have long used and recommended, and has much in its favour, as it is the best size for lantern slides by contact. (There may be some difference of opinion on this point, but we stick to it, the more so as a prominent slide-maker, who took us to task on the subject some eighteen

months ago, has lately been converted, and now uses the above size for his snapshots). There is one objection to many of the box cameras, and to nearly all the rollable-film cameras (of which an immense number of all sizes, shapes, and forms, from the pocket Kodak to the flat-folding $7\frac{1}{2} \times 5$, have been put on the market), which is the impossibility of using the focussing screen, and though this drawback is so great as to seem to many (especially of the older school) to preclude the possibility of serious work, we hardly think it is so bad as that, especially as we see often some very good results which cannot always be attributed to chance.

In regard to mechanical plate-changers, our opinion remains unchanged that cyclists are practically tied to the three before-mentioned methods, as we have not yet found anything else that will stand the vibration.

So far everything has been an advance, but now we come to a step backward, and one which, while being for a time only good for the film-makers, will result in killing the goose that lays the golden eggs. During the year we have seen a large number of negatives which would have delighted the most extreme fuzzyite, and careful examination has shown that the outlines are double or triple, and this we have traced to the long movement in setting and releasing the shutter. It is doubtless convenient to have as few movements as possible, but when one movement does two separate things at the same time, it is more likely to lead to complications, to say nothing of bad language.

So much for the photographic side, now for the cycling. The changes in these have also been an advance, slow but steady, and many of them would, to the ordinary rider, pass quite unnoticed, but to the rider who understands and studies his wheel it is different, and we find a champion like Stocks attributing the increase of speed during the last two years entirely to these slight improvements in the machines, and though we do not go this length, it explains to a great extent the difference between English and American machines, the latter being similar to the English of two or three years ago. Early in the season our attention was called to the number of accidents owing to broken chains. The chains being the light racing ones, the question came to be how they stood the greater strain of racing and so quickly gave way on the road. The bumping and inequalities of the surface was part of the explanation, but not sufficient. It was noticed that the chains generally gave way on a rise, and further investigation showed that the chain stays were slightly bent, thus pulling the wheels out of alignment, causing the chain to mount the cogs and snap. Further study again called attention that the racing machines were fitted with a double bracket and chain stay parallel to the chain, introduced by the Referee Cycle Company some years ago; while roadsters had the chain crossing the stay, which was further bent, and thus weakened. This point was clearly noted by Professor Sharp in his now well-known book *Bicycles and Tricycles*, and leads to the remark that it shows the necessity of having a machine built by a first-class firm, or at least one who thoroughly understands something of the strain and stress with which they are dealing.

So much for the machine, now for carrying. For a half-plate and larger we are still of the opinion that the broad-guage and tricycle is the better machine, while for the bicycle the smaller sizes are best, but instead of using the frame we have now, the carrier of an old Olympia

tandem fitted over our driving wheel, and can strongly recommend this method. It can be fixed to either gentlemen or ladies' machine, is well out of the way—the camera has in this position the least possible vibration—and, lastly, the ease with which it can be fixed and taken off will soon make it the most popular method of carrying.

AN OLD ALBUM.

By Mark Oute.

I came upon an album old, that had been stowed away
With a hundred other useless things, handed over to decay,
Where out of thought, and out of mind, in unused cupboard lie,
Till some pricking memory of the past, induces one to pry.

At sight of that old book, my thoughts flew back to other days,
Its very mildewed covers a thousand memories raise,
For it had been a treasured thing in the days of long ago,
A gallery of trusted friends, a loving picture show.

And as I turn the pages, and on the fading faces gaze,
I hover 'twixt a smile and tear—as looking through a haze
I mark the trace of time on most—and many passed away—
A fashion's term—a span of life—are dreams but of a day.

And with the graver thoughts one feels a grim humour underlying,
And smiles they come against the will, and mingle with our sighing,
For subjects crude and treatments wild so crowd on every page,
The comic side, it seemed to me, was the feature of the age.

Did pictures such commend themselves? Were they admired at all—
The lanky hair, and whiskers long—the figures great and small—
With positions and contortions that would stagger a Chinee?
It puzzles one to-day to think—they were taken seriously.

For the guys that grace these pages, with their hair grotesquely dressed,
And the ladies in their crinolines with waists so tightly pressed;
The sitting and the standing, and the posing that they show,
Are the funniest things in nature—at least, they strike me so,

As time wore on, and phases changed, and modern methods grew,
The album it was thrown aside, giving place to something new
As drawing-room accessory—it has slipped out of our ken—
When productions more imposing came, it was not needed then.

As far behind we leave it—that first milestone on the road—
We can perceive 'twixt then and now the distance we have trod;
For the impressionist is with us with his high-art display.
Will the critic of the future smile—at the pictures of to-day?

ALBUMEN *VERSUS* GELATINE.

By J. H. Baldock, F.C.S.

Another year has come and nearly gone, and our Commander-in-Chief has therefore summoned his forces, and I find myself again invited to contribute to the pages of The British Journal Photographic Almanac.

The subject I have chosen is not a new one; it crops up now and then, but just recently has perhaps attracted more attention than usual. I have been considering the subject for some time past, in view of writing an article for the Almanac, and, therefore, was pleased to note the paper by Messrs. Haddon and Grundy at the Convention, and still more recently the remarks in the Journal by your esteemed contributor, 'Dogberry.'

Taking albumen first, as the oldest, I find the charges brought against it to be mainly four in number: 1. The difficulty of getting good tones, and those uniformly. 2. Blisters. 3. Yellow spots, or a general yellowness all over. 4. Fading. But, if I look at the class of operators from whom such complaints come, I find them to consist chiefly of second-rate professionals and amateurs. I also find, from prints in my possession on albumenised paper, coming from Germany, America, and India, most shocking examples of yellowing and fading, although the tones were, in the first instance, exceptionally *good to look at*. On the other hand, I have seen prints, including some done by myself, many years old, and which have been exposed continuously to daylight, as perfect as on the day when they were first made. This would seem to indicate that prints on albumenised paper *may be* everything that can be desired.

What, then, is the cause of failure? One reason, which I do not think has been taken into sufficient account, is, that the albumen has not been sufficiently fresh when spread on the paper. Albumen is a highly complex organic body of animal origin, containing, among other things, sulphur, which is obtained either from white of egg or blood. Every one is familiar with it, in a state of decomposition, in the form of a rotten egg, and, judging from the extremely mal-odorous condition of some of the samples of albumenised paper on the market, it seems impossible to resist the conclusion that decomposition must have set in *before* the albumen was used; if so, the decomposition products, especially bearing in mind the fact that sulphur is present, must have some action on the silver image. In addition to this, probably some compound of sulphur and silver would be formed, which, not being soluble in hypo, would remain behind in the print after fixing, and tend to produce a change, not only of the print, but of the entire surface of the paper. Apart from this, some negatives seem to be absolutely incapable of giving a satisfactory silver print, and very much depends on the character of the negative, as may be easily seen by the variety of colours assumed by prints when they are taken out of the printing frame, using, of course, the same paper. As for the tone, a great deal depends on the skill and care of the operator, as it must be conceded that greater care is required in the case of albumen compared to that of gelatine.

Blisters are another great source of trouble to the producers of albumenised prints, and the ingenuity which has been expended in avoiding them is simply wonderful. The cause of them is, of course,

that the film of albumen leaves the paper, but *why* it does so has not been made clear. I would suggest three reasons: 1. Air bubbles in the solution of albumen and ammonium chloride. 2. This solution is too thick, and does not readily adhere to the paper. 3. The paper itself is too dry when it is floated on the albumen solution. Of course, in addition to these, *may be* the two reasons generally assigned, *i.e.*, great difference in the *density* of the solutions employed in toning, fixing, &c., and great difference in the *temperature* of these solutions and in that of the final washing water, but that these two cannot be the only reasons seems to be obvious, otherwise all prints done on the same paper, at the same time, and under similar conditions, ought to show blisters, which, however, is not the case.

Yellowing and fading being due, in all probability, to the same causes, whether the paper used be albumenised or gelatinised, I propose to discuss these presently, after treating of gelatino-chloride printing-out paper. Taking the gelatine first, it is very difficult to see wherein this is any improvement on albumen; it also is of animal origin; it too contains sulphur, and is certainly quite as liable to decomposition, if not more so, than albumen, especially bearing in mind that it is hygroscopic, which albumen is not. Do not bacteriologists employ gelatine for their cultures because of its ready decomposition by various forms of bacteria? This substance it is, then, which is employed to emulsify the silver salt, and the *mixture* thus produced is spread on the paper employed. Here we at once meet with a great distinction between albumenised and gelatinised paper; in the first we have a weak chemical compound of albumenate of silver, chloride of silver, nitrate of ammonia, and free acid; in the second we simply have a definite silver salt emulsified in gelatine, the film of which on the paper is much the thicker of the two.

I cannot help asking why the gelatine emulsion is spread upon baryta paper, and not upon plain paper, though I do not remember that the question has ever been raised before. One very obvious drawback is that it makes the prints very heavy, so that all the operations are less easily conducted with this paper than they are with albumenised paper. Take only the one operation of washing: In the washer, albumen prints will swim about like a shoal of herrings, while gelatine prints refuse to move unless the stream of water is almost strong enough to tear them.

The tones obtainable on gelatine prints are perhaps more numerous than can be got on albumen paper, but I doubt if they are any more pleasing to the eye. There is possibly, and I will not deny this, a certain richness and depth in the gelatine print, owing to the composition and greater thickness of the gelatine film, which is lacking in the albumen print, and this may be allowed to count for something; but, without a shadow of doubt, quite as shocking examples may be found among gelatine prints as ever could be among those on albumen, and I also have no doubt but that the 'Combined Bath,' fully treated of and condemned by me in The British Journal of Photography for November 3, 1894, is largely responsible for this. Blisters occasionally occur with gelatino-chloride prints, and may be due to the same causes; but, owing to the great swelling that gelatine undergoes with water, they are more serious when they do occur, and are almost sure to show in the finished print unless very small.

Finally, I come to the yellowing and fading, because it is these which, after a time, render what was once looked upon as a beautiful print, nothing but an eyesore to all its beholders. As I pointed out in my paper on the 'Combined Bath' above referred to, and as again shown by Messrs. Haddon and Grundy (though they do not in any way refer to my *previous* paper), these effects are both due to the same cause, *i.e.*, imperfect fixation. With the combined bath this is easy to understand, because the prints *may be*, and probably *often are*, toned *before* they are fixed, added to which, lead is introduced, which, as I showed, is difficult to eliminate. True it is that since that fatal bath was introduced, a second fixing in plain hypo has been suggested; but, although in this case not much time is saved, still, and what is of more consequence, is the fact that the silver salts are more completely removed.

If the readers of this article will kindly refer once more to my paper of November 3, 1894, they will see that, for the absolutely perfect elimination of all silver salts, I recommended either the employment of a twenty per cent. solution of hypo, washing, and then a bath of ten per cent. ammonia, previous to the final washing, or a strongly ammoniated solution of hypo. The reason for this was on account of the ready solubility of silver chloride in ammonia. What I actually did use was a twenty per cent. solution of hypo, containing twenty-five per cent. of a twenty per cent. solution of ammonia. This, I believe, removed every trace of silver, for paper thus treated has remained perfectly white under the influence of light ever since. Personally, I use a ten per cent. solution of hypo, ammoniated, turning the prints over by hand several times during at least twenty minutes. This I consider safer and better in every way than using a stronger solution. Here, again, my observations seem to be corroborated by the actual experiments of Messrs. Haddon and Grundy, as detailed by them at the Convention, and published in THE BRITISH JOURNAL OF PHOTOGRAPHY on July 23, 1897. It is true that their paper refers to albumenised, and mine to gelatinised, paper; but, taking both results together, they seem to point to the same conclusion I referred to near the commencement of this article, *i.e.*, that yellowing and fading are both probably due to the same cause, insufficient fixing, and that this applies equally to whichever kind of paper is used. The outcome of it all is that there does not seem to be any sufficient reason why just as good prints should not be obtained upon albumenised paper as can be on gelatinised paper, the conditions of success being known, the causes of failure being also understood, and the requisite care being taken to obtain the best possible results.

LANTERN-SIZED NEGATIVES.

By Rev. B. HOLLAND.

IT may be remembered by some that I wrote a short article in last year's ALMANAC advocating the employment of a square plate in the hand camera, and another season's experience in the use of such a plate strongly confirms its utility. As to the best size, that must be a matter for individual taste, but any size up to four inches will be found serviceable. If lantern size is adopted, many advantages will accrue that are certainly deserving of consideration. The resulting negatives will

not only be inexpensive in production (which, to some, may be a recommendation), but they can also be made available for several purposes. Direct prints from them need not appear at all insignificant, as, artistically treated, they bear comparison with much larger work, and may even be made more pictorial. One great advantage in working this size is the smallness of the apparatus required, allowing it to be carried on excursions, where larger would be awkward. Great sharpness, too, may be secured in small negatives, rendering them very suitable for lantern slides and enlargements. Some of the choicest bits, made large enough for wall decoration on bromide paper are not only a source of pleasure to the producer, but would never be recognised as the outcome of what some might reckon an unworthy origin.

What a boon, also, to the cyclist a small camera is! The weight is so trifling, while, if it is properly made with necessary movements, an open landscape or the front of a cathedral, a happily posed group or a striking cloud effect, can be taken as successfully as if one had to set up a huge machine on a heavy tripod, and required a stalwart porter to carry the load.

Let those who have never enjoyed the fascination of this method of work try it, and, if their photographic delight does not increase by leaps and bounds, they will be difficult indeed to please.

ENLARGING BY DAYLIGHT ON NIKKO AND OTHER BROMIDE PAPERS.

By J. H. Smith.

As the Eastman Company, in their instructions for Nikko and other bromide papers, do not give hints for enlarging by daylight, I send, as my annual contribution to the pages of the Almanac, a few remarks on the above subject. Nikko paper lends itself admirably for enlarging upon up to $8\frac{1}{2} \times 6\frac{1}{2}$ and 12×10 from good, clear negatives, the enlargement not requiring any working up, only careful spotting, the finished print having a very pleasing pink hue. To enlarge by daylight, a window should be selected facing north, if possible (but this is not absolutely necessary), and should have an uninterrupted view of the the sky. Block out your window, leaving a space large enough to take your carrier with the negative you wish to enlarge. Place a board outside, covered with white paper, at an angle of about 45°. This will act as a reflector, and throw the light through the negative on to the bromide paper. Place your negative film towards the camera (unless you wish a reversed enlargement, if so, place the negative the opposite way); take out the focussing screen and place the back of the camera close to the negative. Block out all white light. I use a Lancaster's rectograph whole-plate lens, to which I fit a cap made of deep orange or ruby glass. This is a great advantage in enlarging, as, after focussing, and when placing the bromide paper in position, you can tell at once when the image is in proper position for exposure. I use a 12×10 printing frame, having a piece of fine white blotting paper as a pad. Place the frame upon the support and focus enlargement upon this, moving it backwards or forwards to get the requisite degree of sharpness. Now place your

bromide paper in the frame, stop the lens down about half way, and expose. The time required from a good average negative will be from one to two minutes with a good light; but, as the light varies very much at different times of the year, this must be only taken as a guide. Should one part of the enlargement appear more illuminated than the other, or should the negative be thin at one end, take a piece of cardboard and move it up and down midway between the lens and the bromide paper during part of the exposure, thus blocking the part that requires it. If a vignette is required, cut out a shape in cardboard, and hold it three or four inches from the bromide paper, and move it round and round without stopping during the exposure. This, if done properly, will give a fine, soft vignette. Should an enlargement be over-exposed, or have a muddy or green appearance, tone it in the combined bath, as given by the Eastman Company for their Solio paper. You will be pleased with the result, and thereby save an enlargement, which would be otherwise useless. There is no need to give instructions for developing, as this is given in every packet of paper sent out.

PAPERS AND PLATES.

By the Rev. J. Carter Browne, D.D.

Whilst of all the arts, photography is by no means the least progressive, there are phases of it which absorb no inconsiderable time in development.

In regard to the making of the picture itself, the Daguerreotype positive was not long before it found itself superseded by albumen as the substratum whereon a negative was formed. This substance, owing to many difficulties in its preparation and use—most beautiful, though the results invariably were, as shown in the effects produced by such distinguished workers as Messrs. Ferrier and Soulier—held its own only until collodion came in for a reign of over two decades. Injurious or not, certainly the fumes of the ether employed in its composition were so far unpleasant, that the photographic world hailed, with no ordinary sense of relief, the introduction of gelatine, which, so far, seems to have come to stay, and, until something be discovered which may help to further the reproduction of natural colours, one may almost safely predict that, in due time, the gelatine plate will be able to keep its jubilee.

Photographic papers, on the other hand, seem far less conservative in their tenure of office. True, the old albumenised paper held its own for very many years, and is, even now, far from being allowed to fall into desuetude, but the anxiety with regard to permanency is an element which points, sooner or later, inevitably to its disuse. The use of collodion and gelatine as a substratum for the negative naturally quickened the introduction of collodio-chloride and gelatino-chloride papers, and probably, so far as brilliancy, combined with exquisiteness of detail, is concerned, either of these, especially the latter, would be hard to supersede. It must therefore be no small relief, to those who wish to hand down to posterity representations of life in the dying nineteenth century, that platinotype not only claims for itself absolute permanency, but it seems also to have the courage of its convictions. It is only within the past year that I have taken up this method of printing, and, until

something very much superior is brought out, shall be strongly inclined to make a lifelong friend of it. In artistic effect it certainly stands second to none of its *confrères*, but to my mind this great charm is considerably enhanced by the ease and rapidity of manipulation. Frequently I place a print in the window over night, and even before breakfast time it is fully printed, and in less than half an hour mounted and practically finished. The paper lends itself also so kindly to the use of the pencil. Like all else in creation, it has its enemy. In this case humidity is the delinquent, but, so long as the paper is kept dry (by the use of chloride of calcium), one has little or no anxiety as to the rest. To those who have not yet used it, as an amateur, I would certainly say, 'Try it.'

METOL OR PYROGALLOL.

By E. Dunmore.

The little time I have had of late to devote to photography makes me anxious to get the best results with as little trouble as possible when I do indulge in making a few exposures. For many years pyro and ammonia was my sheet anchor, varied occasionally with pyro and soda, and the results were satisfactory; but of late, whether it is owing to an alteration in the manufacture of the emulsion or my own fault, I have not been able to develop a negative *entirely* to my satisfaction with either of these developers if it has been a *trying* subject. I mean by a trying subject one with very dark near objects and light distances, the detail in the shadows coming out too thin, if at all, for good printing, and the lights too dense, although the exposure seemed ample. This applies to several makes of plates I have tried of good repute, so I decided to try in lieu of them metol in combination with hydroquinone, as recommended by Mr. W. B. Bolton, with the most happy results; so much so that I have quite relinquished the use of my old friends for this special combination. If the exposure is anything nearly right there is little difficulty in making a good negative, though for unknown exposures, especially if they are suspected of being over-exposed, I hesitate to recommend it, as, of course, with a one-solution developer, as this is, there is not the same facility for tentative development as with pyro, ammonia, or soda, and the alkali added drop by drop, otherwise I do not think there has been a better form for development published. The only drawback to its use is its effect on the skin. In a day or two after dabbling about in it a kind of subcutaneous eruption on the fingers develops itself, but there is only a slightly unpleasant feeling, no actual pain. Eventually the skin becomes hard and peels off, leaving the fingers looking very unsightly, as if they had been badly burnt or scalded, and some weeks are required for them to assume their normal condition. I find that now, since my skin has become affected by it, merely the slightest moistening of the fingers that have been before affected with this developer will start the eruption. I may say I had used it dozens of times before I suffered any ill effect from it whatever, but now the case is altered, and I have to be very careful how I permit it to come in contact with my hands. However, knowing what to expect, precautions can be easily taken to avoid these unpleasant consequences.

A CHEAP AND SERVICEABLE ROCKING APPARATUS.

By J. F. Hammond.

Obtain any old four-legged stool or chair, which may be found at any second-hand furniture stores. Saw off about half an inch from the bottom of one of the legs and screw on to this a slip of wood, of any convenient length, and about a quarter of an inch thick, this slip to come between the bottom of the leg and the floor. Next, fasten to the top of the chair or stool a square or oblong piece of wood, so as to form a table-top. On this place your dishes, which may be of any number, according to the size of the table-top; press your foot on the projecting slip of wood, and your rocker will work.

A CONTAINER FOR IRON SOLUTION.—FERROUS OXALATE DEVELOPER.

By W. Eaton Bragg.

In spite of the so-called 'advantages' of metol and amidol over ferrous oxalate for the production of lantern slides and prints on bromide paper, the latter appears still to have a considerable number of adherents. After all, faithful old 'ferrous' is hard to beat, its only serious drawback being the poor keeping qualities of the 'iron' solution. From time to time there have been suggestions of one kind and another as to the method of bottling, but, as far as my experience goes, all have been more or less inconvenient and messy.

The following is the description of a clean, effectual, and cheap contrivance for keeping this solution. A glance at the accompanying sketches will show that the whole apparatus consists simply of—

One 'Hock' bottle (minus a bottom)	0*d.*
One small 'stop cock' (ebonite or glass) .... 8*d.* or	9*d.*
One strip of wood (old chocolate box)	
Three bits of ,, ,, ,,	1*d.*
Two strips of tin, three-eights of an inch wide (old coffee tin)	0*d.*
One cork	0*d.*
Total	10*d.*

To prepare the bottle, the bottom must first be disposed of. This may be done in either of the following ways: Cut a nick with a three-cornered file round the side about an inch from the bottom; then touch with the tip of a red-hot poker and a crack will be started which must be followed round until the bottom becomes detached.

The alternate method, which is considerably shorter, and equally successful, is to select a bottle with a 'conical' bottom (fig 5), and, after wrapping a towel round the body, place it flat on a table, and, while holding firmly with the left hand, give a sharp tap in the centre of the cone with the end of an iron poker held about eighteen or twenty inches

from the end. In nine cases out of ten the bottom will be knocked clean in without otherwise injuring the bottle.

After clearing all chips of glass from the inside, fix a sound, tight-fitting cork in the neck through the centre of which, by the aid of a red-hot wire, make a hole slightly smaller than the tap.

Insert the tap and dip the bottle up to half an inch above the cork in hot paraffin wax, to prevent leakage, repeating the operation if necessary; the tap, of course, must be plugged with a bit of wood or cotton wool during the process. A little of the liquid wax is now poured on the inside of cork, the inner end of the tap being plugged with the end of a long penholder.

The bottle being prepared, the next consideration is the bracket or support, A (fig. 1), and for this purpose the side of a chocolate box will do admirably, the proportions, of course, depending on the size of the

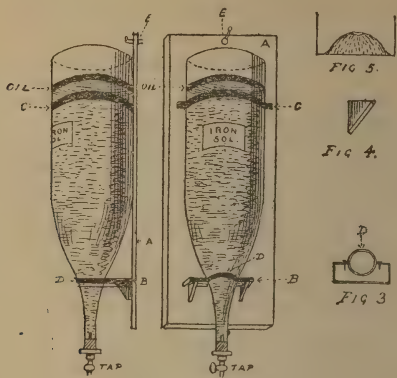


FIG 2. FIG 1.

bottle. B (fig. 1) is a piece of wood hollowed out in the middle, as fig. 3, to take the neck of the bottle. This is fixed in position on the board by a couple of screws from the back, and, as the weight of the bottle, &c., rests on it, it should be strengthened by one or two small supports (fig. 4).

Two strips of tin, three-eighths of an inch wide, cut out of an old coffee or cocoa tin, and fixed in position as at C (fig. 1) and D (fig. 3) complete the apparatus. If a hole is bored at the top, E, the whole thing will hang on a nail in the dark room, and, if not a 'thing of beauty,' will, I feel sure, if carefully constructed, be a 'joy for ever.'

When fixed in position, the iron solution is poured in, on the top of which an ounce or so of castor oil is floated to keep it from contact with the air.

To prevent any crystallised iron settling round the inside of the tap and stopping its action, a short piece of common glass tubing, say, two

inches, should be fixed into the inside of cork before waxing, the cork and tap being withdrawn for that purpose.

The tap can be cleared from time to time by the aid of a piece of stiff wire.

Taps suitable for this purpose can be obtained from any scientific instrument-maker, either in ebonite or glass; the former is, however, preferable.

PLAIN LANGUAGE ABOUT THE SPECTRUM.

By Walter White.

The photographer who ventures to make inquiries about three-colour work is so often advised to photograph the spectrum that he may be pardoned for believing that by doing this he will settle the matter once and for all. In this he is likely to be led astray. I do not wish to speak disrespectfully, or say harsh things about the spectrum. It is a good servant, but a bad master. First mortgage your home and buy a spectroscope. The handy little direct-vision pocket spectroscopes are ridiculous for photo-spectroscopic work. For a hundred pounds or so you may perhaps get a spectroscope that will approach respectability. Having obtained this, somehow, together with your heliostat and sunlight, or your electric or other light, proceed to make photographs of the spectrum through colour screens. Having done this, ask yourself whether the results are what you require. You will probably say, 'How do I know?' and may even ask me in return if they are anything like accurate. To which I echo your question, 'How do I know?' A Chinese proverb says, 'Before commencing any undertaking ask your wife's advice and then—do as you like.' This seems to wonderfully resemble the position in colour photography, 'Make your spectrum negatives and then—do as you like.'

Who can say if results are accurate when there is no agreement as to what constitutes accuracy? We may at least say that an attempt to gauge results by means of three-colour block work is at once crude, unscientific, and reprehensible, even if the inks obtainable were less obviously incorrect than is at present the case.

Captain Abney in his latest work, 'The Action of Light in Photography,' recommends in orthochromatic experimental work the use of a test consisting of the pigments vermilion, emerald green, French ultramarine, and chrome yellow. A plate that translates these correctly in monochrome will, he tells us, correctly translate all other colours. Is there or ought there to be any difficulty in the adoption of a similar or more extended test for colour reproduction?

The study of the spectrum sensibility of plates is an extremely interesting one, and an exhaustive inquiry may, no doubt, result in the acquisition of knowledge, providing that the experimenter has a few years to spare for this kind of work. Otherwise we may safely say that a moderate series of practical experiments will probably teach more than a lifetime of unnatural experiments with the spectrum.

The main reason for the adoption of practical tests is this, that we do not meet with the simple colours of the spectrum in nature. The

statement of Ives that it is less difficult to make screens for three-colour photography of the spectrum than for that of natural objects seems to be to some extent a proof of the existence of this difference.

M. Ducos du Hauron in his recent work on three-colour photography, expressing the same opinion in another form, states that it is impossible to correctly render the colours of the spectrum with colour filters that answer to the requirements of three-colour work. 'The rendering of the spectrum would be limited to a reproduction of only the three primary colours abruptly disconnected, and without intermediate tints.' M. du Hauron explains this fact by mentioning that spectral blue, for example, is simple and does not include, as does the blue of natural objects, a green element capable of acting through the green screen.

A more striking example would, no doubt, be spectral yellow. This might be quite absorbed by red and green screens, which screens would, however, allow the yellow of natural objects, or rather its component parts, to act in both cases on the sensitive plate.

M. Vidal, on the other hand, seems to have allowed this difference to escape his notice; a remarkable statement in his latest work, *Photographie des Couleurs*, can in no other way be accounted for.

A violet screen, absolutely absorbing all yellow rays when tested spectroscopically, may, however, when used in conjunction with a red-sensitive plate, give a negative in which the yellow of natural objects will be represented by a considerable amount of light action. From this M. Vidal infers that there are invisible rays (yellow), just as there are in the case of the ultra-violet.

A very little consideration, however, will show that such a conclusion as this is not warranted by facts. Bear in mind that the yellow of the spectrum is a simple colour, and that natural yellows are to a great extent made up of green and red, and the solution of an apparent mystery is at once evident. The alleged action of the yellow rays is really nothing more than the action of the red element in the composite yellow.

In our own country some prominent three-colour workers recommend the use of a violet screen with a red-sensitive plate for producing the yellow-printing negative. It is clear, however, for the reason just mentioned, that in such a negative the yellow would not be represented by the freedom from deposit that is required if anything like accuracy be aimed at. In matters of this kind the possession of a little elementary knowledge is a decided advantage.

SUNDRIES—IMMATERIAL AND MATERIAL.

By W. T. F. M. Ingall.

The child crying for the moon used to be the type of the wanted but ungetatable; but much that the child cried for the man has got, so rapid has been the advance of science the last sixty years. Before next Jubilee I hope we shall get a plate or film only sensitive to the object, through the objective, when an electric current is passed across it, and development will take place at the same time as exposure, and no fixing required! There's a problem for the next Jubilee!

But, to come down from the moon, why have we no authoritative standard size for plates? We have for screw threads and for stops. To my thinking, the $7\frac{1}{2} \times 5$ involves the most satisfactory standard, being $1\frac{1}{2}$ to 1. Then, by this standard, the quarter would be $3 \times 4\frac{1}{2}$ — $\frac{1}{4}$ less one way, and $\frac{1}{4}$ more the other—the half-plate would be 4×6, and the whole-plate 6 to 9. Although the area of the $7\frac{1}{2} \times 5$ is too large for many, especially users of hand cameras, it is a form that satisfies most people. I commend this to the consideration of the R.P.S. Carriers would accommodate the change to present cameras, and the future make would be adapted to the change.

The Fixing Bath.

I find that hypo, acidified with formic acid, and animal charcoal added, let stand, and filtered, filters out clear, and deposits that which I take to be a combination with part of the sulphur, to which latter in the fixer I believe some, if not all, of the instability of the print or negative is due, if not got rid of by the long washing. If filtered after use, this bath keeps bright. After fixing, a good rinse under the cold-water rose tap is sufficient washing. If I have observed rightly, the final drain will stand the iodide of potassium test. Other advantages are brightness and absence of frilling.

Intensification.

Mercury, coarse in general application, can be made to give a much finer and more even deposit, and without stains, if made as follows: Water 20 ounces, $6\frac{1}{2}$ drachms perchloride of mercury, thoroughly dissolve, then add $1\frac{1}{2}$ drachms of potassic hydrate. When thoroughly precipitated, redissolve with hydrochloric acid, about 1 ounce fluid will be enough to give a very slight reaction.

PLATINOTYPES.

By Thomas Bailey.

We live in the days of many printing processes. Among the most popular of these we have the platinum process, a method of printing that is daily finding more and more favour. Our best professional photographers will tell you that they do an increasing trade in platinum work. Simplicity of working and permanency are its chief recommendations. Given a passable negative, two things only are wanted to secure good prints, viz., paper that has not been affected by the damp, and correct exposure. Success in the latter largely depends on the first. If the worker can secure and keep the paper in a uniform good condition, he will soon master the exposure, and be able to turn out a large number of prints without unevenness and failure. With fresh paper the printing must be carried much further than is necessary if paper that has been affected by damp is used; hence, the printer who is unable to get the paper in an even condition will find some difficulty in turning out even prints. But, even if exposed correctly, damp, stale paper will never yield photographs equal to those produced on fresh paper. Notice must

be taken of the fact that fresh paper prints considerably harder than stale, and will require some dodging in printing. Over-exposed parts of a negative, such as a white dress or a window in an interior, should be printed up.

We hear at times of the yellowing of platinotypes. My experience has led me to believe that this is due chiefly to the paper not being in a good condition at the time of printing. Platinum photographs, that through damp are the least brown when finished, are liable to deteriorate; but if the prints are of a rich black colour, and have been properly cleared and washed according to the instructions sent out by the makers, they will stand any reasonable exposure without changing colour.

The manufacturers assure us that their paper will keep in good order for years if kept unopened in the patent tins in which the paper is supplied. This statement, I think, is hardly correct. I have often printed paper on the day of its arrival along with some that has been in stock in calcium tins for some time; whilst the latter has yielded perfect prints, the photographs on the paper fresh from the dealer have been brown and mealy.

I am often asked which is to be preferred, a silver or platinum photograph. My answer generally is, that it depends upon what is to be done with it. If it is to be placed in an album, next possibly to an enamelled photograph, and surrounded with some gaudy pictures of our army and navy, scenes from Dickens, &c., by all means have the silver print; the success of a platinum photograph largely depends on the mounting and framing. There are now on the market some very artistic mounts and scrap albums suitable for platinums. Very good effects can be got by a combination of white and grey. In conclusion, I would say that, whilst platinum prints on stale paper and badly mounted are unsightly and unstable, a rich black platinum, artistically mounted and framed, is a thing of beauty and a joy for ever.

HAND-CAMERA NOTES.

By Henry V. Lawes.

Possibly the following few notes may be of use to hand-camera men and others. I have lately been a journey to the Antipodes, and with me took my hand camera (a well-known Manchester make), my lens being a Wray rapid rectilinear five-and-a-half-inch, and the plates used were Paget's XXXXX.

My plates I carefully made up in a parcel, and then wrapped the parcel up in waterproof paper, the same stuff that packers use in lining wooden cases. On developing, I find all the plates have kept splendidly, not the slightest sign of damp or deterioration. This, I consider, shows the excellent keeping qualities of the plates, when you take into consideration that they have been in all kinds of weather—at some places, about freezing point, and, in others, anything over 100° in the shade.

Before starting on my trip, I carefully rubbed the inside of my camera well with vaseline, *not thick*, but just enough, so that one could see that some greasy substance had been put on. This I repeated at various times during my journey. The vaseline kept down all the dust, and, consequently, not one of my plates show any signs of dust spots. Before

putting my plates in the sheaths, I dusted them, and when repacking after exposure I again used the brush. Then, as regards the repacking, any one who uses Paget's plates knows that they are put up in an oiled paper and then black paper. These papers I saved, and rewrapped all my plates, and put back in the boxes I originally received them, and then had them put away in the waterproof parcel mentioned above. I might say that no plates were broken at all, although I sent my baggage from Tilbury Docks home to Manchester *per railway*.

I usually find that amongst the majority of amateurs the question of packing plates after exposure is the 'bugbear' of their holidays, and usually they obtain some elaborate tackle, &c., for this job. I think that if they will try my dodge—a very old one by the way—it will be about the simplest, and certainly the cheapest.

At any time, should a brother photographer be going the journey I have had, I shall be very pleased to give him what information I can, &c., as regards dark rooms, societies, &c. Our brother amateurs under the Southern Cross—*I speak from experience*—are exceedingly hospitable, and do all in their power to make a new chum's journey pleasant.

I don't know, Mr. Editor, whether you will permit this or not; but, as your ALMANAC is well known in the Colonies, and, I know, will be read by many friends I have made there, I wish to thank all the photographers, through this book, that I met in Australia and New Zealand for their great kindness to me in trying to make the few leisure hours I had pass so pleasantly.

PHOTOMETERS, ACTINOMETERS, EXPOSURE METERS, EXPOSURE TABLES, &c.,

By GEORGE FERNAU.

AT the beginning of my amateur photographic career I was not slow to perceive, as every tyro does, that good photography is the offspring of right exposure, and, indeed, photography is impossible without such accuracy.

How I envied other 'Camerists' in the field when I saw them majestically uncapping their lenses, and I took it for granted the image taken was unerring! I took it all as gospel at first; but, when I gradually noticed that my superiors, the professionals, often exposed three plates on the same subject, not only in the field, but also in their studios, I began suspecting they were not so omniscient, after all.

Well, I went on plodding and plodding myself, sometimes a little too proud of a partial success, but, honestly speaking, I am now under the impression that the more experience I gained, or rather the more work I did, the less I knew. I would, however, not be beaten, and, bent on mastering the subject, read fifty articles on the mysteries of exposure, bought no end of photometers, actinometers, exposure meters, and all sorts of exposure tables, but all to arrive at an unsatisfactory result, in the sense that I wanted certainties, not approximations. At times, under fair conditions of light, the meters and rules of the meters proved correct; at other times, too frequent, I must confess, under different conditions of light, the instruments on which I had pinned my faith turned out false friends, although I had done all I could to secure their good will.

So, slowly, imperceptibly, I commenced, like many others, believing a little less in meters, and a little more in myself, when one day, in a photographic tour with a Scotch friend of mine who had always expressed himself a strict adept of the rule of thumb and always swore to the uselessness of a scientific guide in exposures, I saw my Scotchman looking, almost by stealth, at what I mistook for a watch, but ultimately turned out to be the philosopher's stone I was longing for. I took, there and then, the address of the maker, and ordered the new desideratum at once.

Blessed be the day when I became the happy possessor of Wynne's Infallible Exposure Meter! All has been sunshine in my photographic work for more than a year that the little instrument has been as permanent a companion in my pocket as it has been an infallible guide to infallible good negatives. I think the word 'infallible' has never been better bestowed.

Invaluable as the meter is for prolonged exposures, it is more so even for instantaneous work in connexion with a judicious choice of the diaphragm, the speed of the shutter, and the conditions of the light illuminating the subject to be photographed.

Not only have I been able to undeniably establish the fact of the unerring accuracy of the meter, but also to witness and realise in many cases that the conditions and changes of light set at defiance the sagacity and the calculating power of the most practised operator in its valuations.

These would already be fair titles in favour of the little instrument, but I will add, that it has usefully served me to compare between one another and gauge sundry sources of light.

Now, as to comparing the different makes of photometers and different tables of exposure, let me say a few words about those that I know, beginning with Wynne's instrument.

The latter allows one to exactly ascertain the photographic value of the light bearing on the subject intended for reproduction, and to strictly estimate, without calculation, the time of exposure required for obtaining a good negative on any brand of plate, with any diaphragm, without hesitation and the possibility of the slightest mistake or error of judgment in the valuation itself or the elements of investigation on which it rests.

In the former, namely, in all the other methods of exposure with which I am familiar, whether they are derived from averages, mathematically calculated, or consist in observing the disappearance of a luminous point through a ground glass or on the-to-be-photographed subject itself, the elements of investigation are so uncertain, so precarious, that two or three operators, every one of them using simultaneously the same instrument, will invariably arrive at different valuations. This experiment I have often tried myself, with one or two assistants, and we never could agree.

In the first case, as regards tables, it is necessary, indeed, to subordinate the valuation of the time of exposure to the month of the year, to the hour of the day, to discern between a clear atmosphere, a grey atmosphere, a foggy atmosphere, a gloomy atmosphere, a limpid sunshine, a cloudy sunshine, and, finally, you must even know how to appreciate the clearness of the air in relation to the wind, as set forth in your meteorological article of March 5 ultimo.

Imagine, therefore, a poor photographer with his apparatus ready for

exposure, and more especially a hand-camera man, obliged to go into the depth of all these calculations, which in their aggregate, amount to more than ten thousand, and yet he must be correct. Not even the Italian shepherd that I knew in my youth, who could solve the most complicated problems of algebra without the use of logarithms, would have been up to the mark.

In the second case, the dwindling away of the luminous point depends mainly on the opacity existing between the eye and the instrument, on the distance between both, and on the duration of the observation, for our retina dilates in darkness and notices objects which it did not at first. There is, moreover, to be borne in mind that, in either of these methods, not sufficient account is taken of one of the most important factors in exposure, viz., the sensitiveness of any plate to be used, a sensitiveness which ought to be carefully analysed beforehand, and well known by the operators.

Wynne's exposure meter in its simple and ingenious, yet, scientific, form, provides for all and every exposure difficulty that may arise, and I think that the inventor is right in asserting that it works well, and from the Poles to the Equator, from sunrise to sunset, from brilliant sunshine to fog, for instantaneous or prolonged time exposures, for open landscapes or dense woodlands, for photographic studio or dimly lightly interiors, for copying or enlarging, for the most rapid or the slowest plate, and with all diaphragms from the largest to the smallest. In my experience of the instrument, I have, however, noticed two defects; one is mechanical, the rotatory did not always move smoothly; but this hitch, when it occurs, is easily overcome by moistening slightly the glass or the fingers when, with a little pressure, the rotation will be restored; the other occasional defect is chemical, inasmuch as the sensitised paper is somewhat prone to become moistened, especially in winter, and more especially still in summer, when, with a perspiring body the case is inadvertently placed in the pocket of one's waistcoat, instead of being left free play in a side pocket. But fortunately the paper thus moistened is not lost and soon is restored to its normal properties by exposing the back part of the case to sunshine, or any other calorific source. All this will rarely happen, but may happen, and the remedy is at hand. I would consider it advisable, however, to be provided with two instruments, for the sake of comparison, and having always one ready that normally reaches the standard tint.

With such slight precautions, go you on, Mr. Amateur, with an elastic step, to your photographic journey, and be sure that with the right exposure that awaits you, and afterwards using a right developer, a good printing paper, and a good toning bath, you will as heartily praise the 'little watch' as I do.

PAPER NEGATIVES.

By W. T. Wilkinson.

The first photographic negative ever made was doubtless on paper, and at various times since the supercession of paper by glass, paper has been used as the vehicle for carrying the sensitive film simply on account of the immense saving in weight, which is a very important item in a day's tramp with the camera.

Until the introduction last year of Wellington & Ward's negative films, paper negatives suffered considerably from granularity, which all the various messy, greasy operations recommended to do away with the grain failed to get rid of; but, in this new introduction, the paper support is so well chosen that even lantern slides made from paper negatives are free from granularity.

The paper is sold in sheets or in spools for roll-holders; it is of fair average speed, P. 60, on Watkin's exposure meter, *f*-56 on Wynne's. The best results are obtained by giving a full exposure and developing with a solution containing a little more pyro than is usual with a plate, say, four grains of pyro to each ounce of developer. The manufacturers recommend pyro-ammonia. I prefer pyro-soda, and I think our Editor will agree that the sample sent herewith is quite as good as need be wished for. In developing negatives on paper, it is difficult to judge the density by looking through, but the way out of this difficult is to adopt Watkins' system of timing development, by which method far more even results can be got with either glass or paper negatives than by guessing at density by looking through. This system of development is perfect, and only requires trying to be always used.

For making enlarged negatives there can be nothing better than these paper films in convenience and cost, and the paper back offers such facilities for working up and retouching.

A number of paper negatives can be washed in a flat 12 × 10 dish, so saving room. In fact, paper films save weight, cost, and room, and as for storage afterwards that is easy.

To obtain the very best results, the negatives, after a thorough washing and aluming, should be squeegeed, face down, on a sheet of chalked glass, and, when dry, they will strip off with a glossy surface, which does much towards ensuring freedom from granularity.

THE MODIFICATION OF CONTRASTS.

By Matthew Surface.

The use of a brush dipped in a solution of potassium bromide is usually recommended in developing negatives having very strong contrasts, but the method is not one which I have found satisfactory on the whole. I had occasion recently to take some topographical views of scenery in a limestone-rock district, characterised by high cliffs and deep gorges, usually brilliantly lighted on the one side, but plunged in gloomy darkness on the other. Of course the dry plate tends to accentuate such effects, and, without careful manipulation, I should have had very hard negatives indeed, but the difficulty was overcome in this manner. The plates were immersed in the developer in the usual way, and, as soon as the image began to appear distinctly, the negative was removed and rinsed under the tap; then, by holding what appeared to be the under-exposed parts under the developer again, and carefully keeping the other side out of it, the parts in shadow were brought up rather more nearly to a correct visual standard, when the plate was once more entirely immersed in the developer until development was completed. Of course great care must be exercised in treating certain portions of the plate not to allow the

developer to remain in a hard and fast line on one part only, but a gentle oscillation should be imparted to the fluid. Naturally, this plan would not answer for negatives with, say, a very small portion in the centre of the plate which required more development than the remainder, in which case a brush dipped in developer might be used, but it would do well enough in the case of such a subject as the passage of a cave leading towards daylight. The main thing is to exercise a fair amount of dexterity in rocking the dish, holding the plate at the right angle, and taking the greatest care not to allow the developer to remain too long a time in one place. One need hardly say also that the possibility of producing a good negative is also greatly enhanced by employing a weak developer. I am quite aware there is nothing new in the method suggested, and probably most experienced workers are acquainted with it; but, on the other hand, it may prove a new suggestion to many.

AMMONIA IN INTENSIFICATION.

By Chapman Jones.

The general rule in intensification is to select any convenient method, and to use it on all occasions. Hence we have some advocating one method, and some another, and with no discrimination. It is, of course, desirable to use that method that will give the effect that is sought after, but this supposes that the photographer knows what he wants, and also that he knows the distinguishing effects of different methods of intensification, and I fear that in many cases he knows neither. I have shown that, of the ordinary methods of intensification with mercury, ferrous oxalate is the only follower to the mercury salt that gives a uniform action throughout, but the very irregularity of the effect produced by ammonia may sometimes be an advantage.

One important fact relating to the use of ammonia is that the resulting image is not of a permanent character, but it may safely be employed for negatives that are not wanted for more than a few months. The increase of density is followed by a thinning of the image, and the effect varies according to the strength and time of application of the ammonia. If, therefore, it is desired to intensify a negative of a black-and-white subject, ammonia is advantageous, because it gives a considerable increase of opacity in the already dense deposit, and the slight fog over the parts that should be transparent is perhaps not intensified; indeed, it may be actually reduced. In this I find ammonia to be more reliable than silver potassium cyanide, for while both reagents are uncertain in their action, the latter appears to vary more than ammonia does in its effect upon the thinnest parts of the plate; and, as to permanency of image, there is not much to choose between them, but the advantage seems rather in this matter also to lie with ammonia.

Ammonia gives a greater intensification effect, on the whole, than one application of the ferrous oxalate method, but may give less in the thin detail. Suppose, for example, a skeleton photograph made by means of the Röntgen rays is too feeble, the detail in the bones being given but scarcely printable for thinness. Mercury and ammonia would intensify the dark background, and make the negative, as a

whole, more brilliant-looking, but the thin detail probably would be thinner than before by comparison with the other parts, and the plate would be worse after than before intensification. In such a case ammonia is quite unsuitable. It might now and again improve matters, for it is not uniform in its effects, but the probability is that its use in such a case would lead to disappointment, if not disaster. But ferrous oxalate would fully intensify the weakest parts, and by a second, or, if necessary, further repetitions of the process, any density required might be obtained; and the plate as a whole would be more harmonious, stronger in detail but not crudely hard.

DEVELOPERS: THEIR ACTION AND USE.

By W. Fenton-Jones.

I thought the Editor would have let me off this year, but a polite request, framed in his usual unctuous way, is irresistible; so, at the risk of being anathematised for my temerity, I hasten to comply with his request.

I generally make a rule of taking down all formulæ which promise to produce pleasing results, so propose taking this subject up in as short a space as can be allotted me in the issue of this year's Almanac, with the hope that it may be of service to those who have not had the time or desire to do it, as I have had. The main question is, What sort of negative do we desire to produce? Some people say, 'Give me a nice black-and-white negative;' others, 'I prefer a bilious-looking one.' I fancy I can hear the reader say, 'What do you use now?' Well, I'll tell you. For the last three years I have used the following, due to Messrs. Wratten & Wainwright, though slightly modified:—

No. 1.

Pyro	1 ounce.
Sulphuric acid	1 drachm.
Sulphite soda	4 ounces.
Distilled water	80 ounces.

No. 2.

Carbonate soda	6 ounces.
Distilled water	80 ounces.

For use:—Landscape work, equal parts of each; portraiture, or softer effects than landscape, one part of each and one of water.

The colour this produces is yellow in character, graduated according to the strength of solution, but is fast in action, doubling the speed of plates according to the H. & D. method quoted on the box. The above has been used with several different makes of plates, and has been found to act well with all. Those who like a negative with clear glass will find the following give what they want:—

Pyro	3 grains,
Bromide of potassium	3 grains,
Ammonia	2 or 3 minims (·880),

and to each ounce of water (the above being taken as for 1 ounce) add 1 ounce of saturated solution of sulphite soda. Of course, with

this there is no stain. Then, another pleasing formula is one which I believe is sold under the name of Graphol, consisting of the following :—

Eikonogen	60 grains.
Hydroquinone	80 grains.
Sulphite soda	1½ ounces.
Citric acid	40 grains.
Carbonate potash	6 drachms.

Dissolve in 22 ounces of hot water (distilled), add the citric acid after all other ingredients have been dissolved. This gives a blue-black negative, and, whilst plenty of contrast is obtained, it is not hard. To go fully into the question of developers for negative-making would take too long, so I will content myself with giving the above for that branch, and now turn to the making of lantern slides. Here, again, the colour comes into question, so we will briefly deal with it. For a nice warm sepia-coloured slide the following is particularly good :—

Solution A (as No. 1 of first formula, above).

Solution B.

Carbonate ammonia	3 drachms, 2 scruples.
Caustic potash	3 drachms.
Ammonium bromide	3½ drachms.
Water	20 ounces.

This formula is used in equal parts.

The ten per cent. solutions issued by several firms will produce colours varying from Bartolozzi red to deep black, the colour varying according to exposure, whilst those who wish for more latitude in colour will get it from Alpha plates, which, however, should be more carefully handled. A good all-round developer is undoubtedly that due to the Ilford Company, consisting of :—

No. 1.

Quinol	2 drachms, 2 scruples.
Bromide potash	30 grains.
Sulphite soda	2 ounces.
Water	to 20 ounces.

No. 2.

Caustic soda	100 grains.
Water	to 20 ounces.

This can be used for plates, transparencies, bromide, or Alpha papers, and is, for a beginner, particularly suitable, as there is no stain, which seems such a bugbear to those about to start the black art.

For bromide work, in the writer's opinion, there is no formula which can touch that of the Eastman Company, as follows :—

Amidol	1 drachm.
Sulphite soda	4 drachms.
Water	10 ounces.

This must be made freshly, and used—say, inside of a week—without further dilution. It has the advantage of working tolerably fast, and with nice velvety shadows,

'A SLIPPERY CUSTOMER.'

By Richard Penlake.

How often the above term is applied to some of our two-legged friends —ourselves too, perhaps—one never knows; but I doubt very much if any one earns that particular designation so well as our three-legged friend, the tripod. How excellently the latter skates upon some of those highly glazed floors that abound so profusely in our ecclesiastical and other notable buildings! I sometimes wonder how some people manage to get in and out of church at all.

Patent appliances to prevent slipping have at various times found their way into the market, and I have a strong suspicion that that is as far as they ever did get, for I never heard of, or saw, any being used. Cork and indiarubber tips, as well as many other simple and useful dodges, are often recommended by some of those publications that are so fond of ramming such simple and useful (?) dodges down one's throat, but I doubt very much if the writers of those 'pars.' ever used them; if they did, it was certainly under very favourable circumstances, or I think they would have found that cork, indiarubber, &c., were, when placed at a certain angle, quite as slippery as the original wood, iron, or brass tip of the tripod leg.

One would think by the above remarks that I had discovered the philosopher's stone, or had patented an invaluable invention of my own, but such, I can assure my readers, is not the case. I would it were. My object in writing these few lines is to give my experiences of slipping tripods, and also to relate a little adventure, the further possibilities of which I will leave for those who have plenty of spare time on hand for experiment.

During the past summer I made many negatives of the interiors of our most important buildings, and, while so doing, I had the opportunity of trying all the dodges I knew of to prevent my tripod legs slipping. The result of it all is, my tripod legs are fitted with sharp iron spikes of about an inch in length. I find nothing more efficient. In the majority of cathedrals I find cracks, joins, or inscriptions cut in the floor, and into these I stick my spikes; if the said cracks, &c., are of sufficient depth—and most of them are—there is no danger of the tripod slipping. Should such conveniences not be at hand, cocoanut matting, a hassock, or other soft flooring material, is sure to be there; into such the iron spikes will easily stick. Always have the tripod legs as near together as possible, because, the further apart they be, the more likely they will be to move. Sanderson's patent camera, by the way, is a most useful piece of apparatus to architectural workers, because, when once the tripod holding the camera is firmly fixed, there is no need to again move it, because the patent front does all the 'getting in.'

And now for the little adventure I spoke of. One morning I was exposing a plate (the last I had with me) upon the beautiful marble that surrounds the shrine of St. Cecilia, in Brompton Oratory. I had just taken off the cap with the intention of giving ten minutes' exposure. Five minutes had gone when I accidentally knocked against the front leg of my tripod, and moved it about an inch. (Yes, it was really I that did it, not a visitor, as I was locked alone in the place.) Many things both

good and evil passed through my brain at that moment, more especially as it was my only plate, and a very large one too. To put on the cap would mean under-exposure, and that would not do, as there was much detail in the darker parts; to expose the full time, *i.e.*, ten minutes, would mean a double image, so I gave up all idea of a good result.

Suddenly an idea struck me, and I made up my mind to considerably over-expose the plate, and also to develop for extreme over-exposure; by so doing I thought perhaps the long exposure would develop correctly, whilst the shorter exposure would not show. Such proved to be correct. I gave the plate twenty minutes' exposure, and developed accordingly, with the result that the fifteen minutes' exposure developed up very well, while the five minutes' portion refused to appear.

The above dodge would, of course, not be possible when windows, or other very strong high lights, appear in the field of view, because the light is sufficiently strong from the same to cause a 'ghost' to appear, no matter how short the exposure may be.

I do not say my discovery (?) or experience is new, because it seems such a simple thing to do, and many perhaps have done the very same thing; but, after being a constant reader of the journals for many years, I never remember seeing such an instance recorded. It may be, therefore, that my little experience may be the means of saving a brother photographer's plate, should he meet with such a misfortune.

HINTS ON OUTDOOR WORK.

By Thos. Stokoe.

The Editor has done me the honour to ask for a contribution for the Almanac, and, as a request from the autocrat of the editorial sanctum carries the authority of a command, I am fain to comply by giving hints as to a few helps in out-door work. And, first, let me recommend a flat leather bag, with cover, with strap over the shoulder for carrying a dark slide for the largest camera employed. Only one who has used such a bag can appreciate the convenience of having the slide carried securely and protected from the light, while both hands are free for fixing the instrument.

For making the exposures, I would suggest the use of a sky shade, instead of a lens cap or other contrivance, as, by slowly raising and lowering the flap, a longer exposure is given to the foreground than to the sky. By this means I have often succeeded in getting natural clouds of correct printing density.

Another appliance which I had made to my own design, and have used with advantage for some years, is a tilting table for fixing to the top of tripod stand. This, perhaps, is more useful in the lofty interiors of churches than in out-door work, but is always serviceable where a high building has to be dealt with at close quarters, as it avoids the necessity for placing the camera at a perilous angle by means of the tripod legs. My table for a 10×8 camera is about six inches by five inches, of two pieces of wood, clamped, and hinged at the back. The lower half is fixed to the tripod head by a bolt and flynut, and in it is an opening, through which the camera screw is passed to a hole in the

upper half to secure the camera resting on it. A piece of brass with a slot in it connects the fronts of the two leaves, and the upper leaf is fixed at any required angle by a set screw in the lower leaf working through the slot. This piece of brass is pivoted on a screw, and, when the table is not in use, lies along the front of the flap to which it is attached.

Lastly, a hint as to the photographing of horses. I have found that the best way of getting them quiet in an animated pose is to have another horse led within sight or trotted within hearing of them. This discovery was accidental, for on one occasion, after vainly trying to secure a good pose in a hunter, whose rider was anxious to be off to the meet, and whose patience was well-nigh exhausted, I was on the point of giving it up for that day when another huntsman trotted his horse along the road within hearing. My subject immediately stood at attention, and I secured one of the finest negatives of a horse I ever took, a picture which brought me both credit and profit. I have since repeated the experience, and, when photographing horses in a meadow, have tried having one led across within sight with equally good effect.

A CONVENIENT WORK AND DARK ROOM.

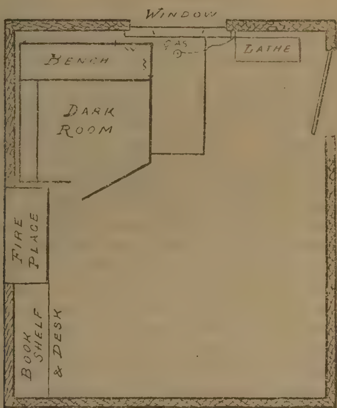
By J. Pike.

During an experience of nearly twenty-five years I have had to work under a great variety of conditions. The amateur with a passion for mechanics and photography is a trying individual—*i.e.*, to every one but himself. He is hustled about usually from pillar to post, cellar, garret, bathroom, and scullery. He is in every one's way. In addition to this experience, I have had the use of various really commodious rooms, and have done good work, and even made very fair dry plates in an out-of-door "sentry box," measuring three feet three square, by six feet six high. It is, after all, largely a matter of arrangement of fittings and apparatus. In the sentry box aforesaid (one of the *portable* variety, which, once put up, can never be got apart again) I had an enlarging apparatus fitted in the roof, the enlarged image being thrown directly on to the work-bench; there was, of course, a small window, and I had gas laid on outside for use if required; by a simple arrangement of zinc pipes the source of light was used to warm the small drying closet in one corner. No dark room is, in my opinion, complete without a drying closet. In addition, there were shelves and poison cupboard, places for all requisites, and, I need hardly say, there was only room enough for one person to work there with any comfort.

Now, I am thankful to say, after many trials and discomforts, I have at last got (to the mere average man and householder) an almost ideal workroom, and I append a sketch of the arrangements. The room is a top back square bedroom, which I have, so to speak, "staked out," and made an indispensible claim to. The window faces north, and there is an uninterrupted view, *i.e.*, nothing to interfere with enlarging operations. In one corner of this room I fixed a dark room or closet. It is really a framework of one and a half inch stuff, covered tightly with canvas, then well papered, first with brown paper, and finished off with

a good wall paper. The door requires careful fitting, but a curtain inside makes all secure. The windows, two in number, are at the corners, (marked w), most convenient for work by daylight or gas. The internal fittings are as usual. Outside is a fixed bench, facing the large centre pane of glass. I find this very handy for supporting the enlarging apparatus. A *shutter* also, with the usual openings top and bottom, completely covers the window when it is required, for enlarging purposes, to convert the whole room into a dark room.

So far, these fittings are of the simplest nature, but each neatly put together, and made, as far as can be, with an eye almost to decorative effect. The great objection to a work room in a private house is the unsightliness, as a general rule, and untidiness of the arrangements, if



what is mostly *chaos* may be termed arrangement. The floor should be covered with linoleum or oilcloth; and plenty of shelf room, with neat and inexpensive curtains to hang in front, will obviate all necessity for litter or things left about. My idea is to make the room a comfortable study, smoke-room, reading-room, and workroom, and on occasions it is (for there is plenty of space) a bedroom. In one corner, next to the fireplace, is a bookcase and desk. Here I keep all photographic apparatus, negatives, and printing paraphernalia, and one can work undisturbed. It is hardly the best place for a *lathe*, but such work as I do in that way is light and easy—a little turning at times, and occasionally some winding, as 'coil' making. The 'bench' is used mostly, of course, for general work—carpentering and joining—but this done, tools put away, and floor swept, a tablecloth covers all this, and I can get to work with coil and battery, and give demonstrations of X-ray work without having to make apologies for surrounding "litter." A good three or fourfold screen is by no means the least of one's requirements in a room of this kind, particularly when enlarging. The dark closet, of course, is fitted, as most of these places are, with plenty of shelves and racks for

dishes and bottles, and everything is ready to hand for photographic work if needful. In addition to the suggestion of comfort in one's surroundings, I am sure the great objection to 'amateur work' in our private houses—objection which naturally comes from the lady of the house—is practically removed, if neatness and order prevail, with an eye to some decorative effect. In other words, make the room *useful* certainly, but also as ornamental as possible.

ON THE CONDITIONS REQUIRED FOR OBTAINING A NATURAL EFFECT IN STEREOSCOPIC SLIDES.

By J. F. T.

Having been asked to contribute a short paper to the Almanac for next year, I propose to describe the conditions under which a natural effect will be produced in pictures viewed in an ordinary refracting stereoscope. I shall assume that the camera employed to take the pictures has two lenses, and consequently takes small pictures for slides, because when a shifting camera is employed to take the two pictures in succession, the objects must be immovable, and such can be better made the subject of larger pictures for use in a reflecting stereoscope.

It is of course well understood by all who are interested in stereoscopic work that the appearance of *solidity* in a stereoscope is due to our seeing two different pictures, each being appropriate to the eye which views it; the amount of difference is small because the distance between ordinary eyes is only about 2½ in., which is very small compared with the distance of the objects viewed, and we must be careful to preserve this condition if we wish to have a natural representation. Let us consider what would be the result of seeing with the eyes of a giant whose eyes were 5 in. apart, or double the distance of ours: so far as the picture of either eye is concerned, the pictures would be similar to those of our own eyes in the same places, the angles subtended by the objects being the same as to us; but, when we examine the effect of the binocular vision, the case would be different—an object 60 ft. off would be 144 eye-distances from the giant instead of being 288 as to us. The small differences of position in the two pictures would thus be twice as great as to us, and if we could take these two pictures and see them with our eyes, we should see the objects subtending the same angle but displaced by the shift from eye to eye as if at only half the distance from us: the effect would therefore be that of looking at a model on half scale placed at half the distance. Whenever the distance of the lenses in a binocular camera exceeds the distance of the eyes, more or less of this effect is produced, and though, no doubt, in pictures of landscapes (where there are no near objects) some increase of the lens interval is admissible, or even advisable, in order to separate the planes in the picture more, still, this separating of the lenses should be done with great caution, and, in fact, distance without near objects is not suited for stereoscopic pictures. My old camera had the lenses about 2¾ in. apart, and I never found this distance too little, but of course I did not use it on unsuitable subjects. I should think that an interval of 3 in. between the lenses was an extreme amount, but it would be well to have the distance adjustable so that it might be reduced for nearer objects.

In order that the objects in the pictures should subtend the same angles in the stereoscope as they do in nature it is essential that the lens with which they are examined should be theoretically of the same, and practically of nearly the same, focal distance as that of the pair of lenses with which the pictures were taken, and they should admit of some adjustment for the distance of the eyes, so that the directions of distant objects seen through them may be parallel for the two eyes. When the images are so placed on the slide that the distance between the two representations of a very distant object are separated by exactly the distance of the eyes, the lenses may be of the ordinary form, that is, the axes of the two surfaces may coincide, and even if this distance be slightly exceeded, the eyes will be able to bring the images together, but if the excess be material, it is desirable that the superposition should be obtained by prisms of suitable angle. Such prisms, which are virtually introduced into almost all stereoscopes I have seen, should, however, always have a small angle.* Their use enables the pictures on the slides to include somewhat larger angles, but I think that the most natural effect would be produced by lenses of the ordinary form in which the surfaces have a common axis. The best stereoscope I ever came across had lenses very nearly of this construction.

It is not, I think, desirable to have the lenses of the camera and stereoscope of very short focus—about 6 in. is a common one for those of the stereoscope, and I think this is a fair value for general purposes—I do not think that wide angles are appropriate for stereoscopic lenses, because the resulting pictures should, on the principles I have laid down, require wide angle lenses to examine them, and these are not available in most cases.

SUCCESS IN GETTING WARM TONES ON BROMIDE PAPER.

By G. E. Brown, A.I.C.

In order to assist any who have been unsuccessful in using uranium toning, the following brief hints are given.

If the directions given are followed, I think good results will follow.

Several points must have attention, but these once recognised, the method is easy and certain, and should certainly be used by all who wish to make the fullest use of bromide paper. It is the best way of getting a warm-toned enlargement direct.

First as to the developer. Do not use ferrous oxalate. Metol or amidol, either of which gives charming results, is preferable. Be careful not to over-develop or choke up the shadows. Light prints give the best results, especially for the redder tones. To get full detail without excessive density, add water to the developer. Wash well, as usual, before fixing. Fixing must be thorough. This is most important. The bath must be fresh and the prints kept moving. A bath containing two

* In some cases, the lenses, while prismatic inasmuch as they cause the pictures to approach, are cylindrical in cross section, and, in this case, by turning them round in their sockets, the pictures can be raised or lowered with reference to each other This enables any defect in mounting which makes one picture higher than the other to be adjusted.

ounces of hypo to the pint, in which prints are turned over for fifteen minutes will ensure proper fixation. Wash in running water or frequent changes (five minutes) for one hour; then place for fifteen minutes in an alum and citric acid bath—

Alum	2 ounces.
Citric acid	¼ ounce.
Water	20 ounces.

Keep moving in this and then wash in running water for three-quarters of an hour. Meanwhile prepare toning bath. Make a stock solution of—

Uranium nitrate	10 grains.
Water	5 ounces.

This will keep best in the dark. Make also a solution of—

Potassic ferricyanide	10 grains.
Water	5 ounces.

Rinse the ferricyanide crystals once or twice with water, pour off water, and dry between blotting-paper before weighing. This solution does not keep well. It is best to prepare it fresh each time. To make the toning bath, mix equal parts of these solutions, and to every ounce add twenty-five minims of "glacial" acetic acid. Place the print in a white porcelain dish, and keep the toning solution gently flowing over it. The change of colour is gradual from black or grey to red, through chocolate and reddish-brown. As soon as desired tone is reached, remove print and place in large dish of running water. Be careful not to allow the entering water to impinge on the print. This will cause a light patch. The best plan is to admit the water at the bottom of a deep basin by means of an indiarubber tube. Notice that the ground of the print is stained yellow. Washing will remove this. Wash as little as possible; six or seven minutes ought to remove all yellow from the lights. Further washing removes the uranium tone. As soon as clean, remove from water, and blot off all drops of water with a piece of blotting-paper (Robosal is best). Neglect of this will cause patches. A brilliant red tone is got by toning as far as possible in bath, removing the yellow stain, and then placing print in Farmer's reducer, made by making some hypo solution (two ounces to the pint), and adding ferricyanide of potash solution (strength immaterial) until solution is lemon yellow. This takes out the black silver deposit, and leaves the uranium red.

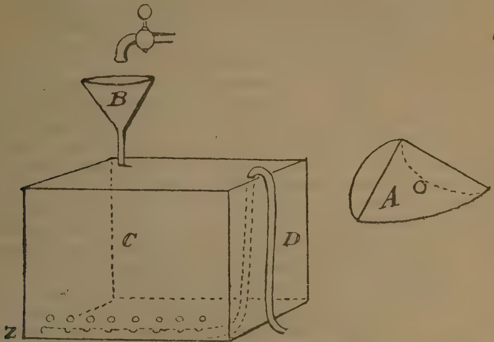
En resumé. The points for success are: (1) Thorough fixing; (2) Thorough removal of hypo; (3) Pure ferricyanide and freshly mixed toning bath; (4) Uniform washing and removal of drops of wash water.

A USEFUL APPARATUS FOR QUICKLY WASHING PLATES AND PRINTS.

By Major C. Gardner Vatcheb.

The following cheaply improvised apparatus will be found useful for washing plates, &c. First procure a cheap, say, threepenny or fourpenny, tin funnel, and should one use, as I do, the Champion rack in an oblong tank, bend a piece of tin to grasp the corner of it, A, in sketch, and bore

a hole in the corner piece to pass the funnel, B, down through. The funnel is to avoid splash. Next procure a piece of compo pipe from a gasfitter, and bend it like D in sketch. Squeeze the end of it, as at Z, to one-sixteenth of an inch, and bore with a bradawl holes as at O. These act as a drainer. It is obvious that the supply of water from the main can be regulated to the amount passing away through the syphon.



In last year's ALMANAC, by a printer's error, my pyro-cum-metol formula reads all wrong by the omission of proper stops. It should read:—Of a pyro 10 per cent. solution use 20 minims; of a bromide of potassium 10 per cent. solution use 30 minims; of a carbonate of soda 10 per cent. solution use 180 minims; and of a solution of metol (Hauff) 50 grains, water 10 ounces, sulphite of soda 1 ounce; use 30 minims and make up to 1 ounce with water.

If the plates flash up, use more bromide and more water. Plates of slower speed require less metol solution.

HALATION AND BACKING.

By GEORGE T. HARRIS.

HALATION is a perennial subject in photographic circles. It is the analogue of *East Lynne* in dramatic economy; when all else fails, produce the subject of backing, and the hum of approval that goes up from the photographic world testifies to the popularity of the theme. At first sight it would appear that the man who should discover an effective remedy for the evil of halation would come dangerously near being canonised. This is not so, however, as a little deeper reflection will prove. His name, on the contrary, would be held up for objurgation into the third and fourth generation as having destroyed one of the pet topics of a photographer's life. Blessed be halation!

This year the microbe of halation has been unusually active, having early in the year attacked the plate-makers, prompting them to issue ready-backed plates, which have proved a royal battle-field for belligerent backers, and causing a ferment in the photographic world, as is the wont

of microbes generally. To my system also came this bacillum in due course, whereupon I got me to a dealer and purchased many dozen 'ready backed,' as set forth in the advertisement, taking them and a hand camera for a yachting cruise on the Norfolk Broads. I photographed the rising sun, the setting sun, and views against the mid-day light, but no trace of halation did I get, and I said, '*Requiescat in pace*, halation. Halation is dead!' Some day, when the urgent business of life is over, I shall remove the backing from those negatives and print from them, and give the companions of that voyage the prints they are now wondering why they don't get—if they are alive.

And yet collodion is a perfectly manageable and convenient backing when of suitable construction. Several years ago, when photographing one of the English cathedrals, my supply of backing became exhausted, and none of the photographic dealers stocked such an article, so I went to a medical friend, who supplied me from his surgery with a pound bottle of collodion and some fuchsin from his case of stains. The collodion was very thick, more so even than the ordinary enamel collodion, and I diluted it with an equal bulk of ether and alcohol, adding the alcoholic solution of fuchsin until the colour was deemed preventive enough. As a backing it left nothing to be desired. Some difficult windows of the cathedral were rendered quite free from halation, and it was removed from the plate after development in the readiest manner possible; being tough and leathery, it came away in pieces of two or three inches square. A dozen or more 10×8 and 12×10 plates were coated at night and left exposed in the developing tent for the solvents to evaporate, then the slides filled with them. There was absolutely no trouble either in applying or removing the backing. Clearly collodion as a backing is not at fault when properly used, and I gave up its use not from any inefficiency or trouble in manipulating it, but that when Forrestier's backing in collapsible tubes was introduced, I could not resist the convenient and portable way it provided for the landscape photographer to carry with him a supply of backing that could not come to grief or make itself a nuisance by leaking or evaporation.

But is backing a necessity for the average landscape subject? With the average commercial plate I am willing to admit that it is; that, indeed, it is almost a paramount necessity if the best results are desired; but with plates of home preparation, where the thickness of films is under the control of the user, I am convinced that for nine-tenths of landscape subjects backing is a merely superogatory operation. Some years ago I discussed this point with the late Mr. William Bedford, who was one of the most reliable and exact workers it is possible to imagine, and he gave as his conviction, from practical experiments in the field, that with plates having generous films backing was not only unnecessary, but in point of fact inoperative. Such a remark, I would like to repeat, applies only to the usual landscape subject, and not to glens, where bright sky appears through the interstices of foliage, nor to interiors with difficult windows; in such subjects one would naturally provide against the contingency of halation. Mr. Bedford's test was a very simple one, and appears to me a thoroughly conclusive one too. He coated half a plate with backing, exposed it, and, after development, criticised the finished negative, when it was impossible to say which half of the negative had been subjected to backing.

Very few commercial plates would, I fancy, emerge successfully from a similar test; they are far too thinly coated for such a trial. The plates I am referring to had the necessary opacity well established by the time the faintest indication of skyline had made its appearance at the back of the plate. The tinge of colour imparted to the film by the orthochromatic agent was also a further means of securing immunity against halation. With the majority of plates with which I am acquainted, the details of the subject are readily discernible at the back of the plate by the time development is finished. Common sense dictates that with such a plate as this brilliance of image is not to be expected unless backing of some kind be applied. Some brands of commercial plates, especially of the so-called 'ordinary rapidity,' are notable exceptions to the thinly coated plates that are usually distributed, and, with the price of silver so low as it has been for a long time now, there would seem no valid excuse for refusing a more generous supply of emulsion to each plate.

In a recent issue of a photographic paper was an article illustrated by views of a ruin well known to me from photographic experience. Each one of the views, and there were some half-dozen of them, had the upper parts of the building almost lost in the sky by severe halation, and yet the photographs had the appearance of having been taken in a good light and correctly exposed. They were subjects upon which I certainly would not have used backed plates; in fact, having photographed the identical views, I can conclusively say that, with a good plate, backing would be absolutely unnecessary. How the author of them managed to secure the amount of halation he did is a puzzle to me, and my inference is that it was entirely the result of using a thinly coated plate unbacked.

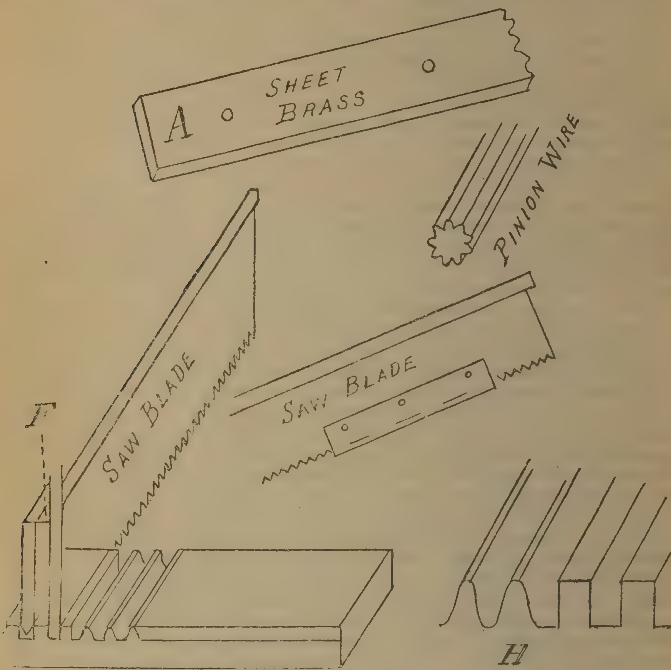
The trouble of backing a few plates when required for special subjects is so small, and in a professional business comes so incidentally, that it is really scarcely worth consideration, and the man who magnifies such a trifle until it becomes an incubus in his photographic life stands self-confessed as either an incompetent or very lazy worker, With a well-made caramel and sienna backing, like the one previously mentioned, a dozen 10×8 plates can be properly backed in as many minutes. Squeezing out sufficient quantity upon the plate, it is evenly distributed over the back with one of the small hollow indiarubber balls sold at toyshops, a piece of brown paper, cut rather less in size than the plate, is pressed in contact with the backing, and the plate put at once into the plateholder. If development takes place at once, the paper can usually be peeled off without any difficulty, and the backing may either be removed with a damp sponge or allowed to dissolve during development. On the other hand, development may be deferred as long as desirable without the backing and attached paper becoming unmanageable; all that is necessary is to take care, when developing, that the developer has access to the back of the plate, and, before density is obtained, the paper will be easily stripped from the plate, and the backing so moistened that it at once becomes incorporated with the developer. I have treated hundreds of plates in this manner, and without the convenience of a properly appointed dark room, yet the 'trouble and messiness of backing,' chanted with such wearying persistence in photographic circles, have failed to make themselves felt more prominently than any of the other minor operations in photography.

BRASS RACKWORK.

By R. T. Baxter.

Every year it becomes more and more difficult to find fresh contributions for the annuals; however, here is something that amateur camera-builders will find extremely useful, and economical for their pocket at least—that is, making their own rackwork.

Obtain from a watchmaker's dealer a piece of stout pinion wire of the size required. On the top of every one of the teeth rub a little ink; common ink will do. Now run or roll the pinion wire over a piece of clean writing paper, so as to leave an impression of the width of the



teeth or pitch, as it is mechanically called. Now find the exact width or space between any two teeth, file out a piece of brass exactly to this width.

Shape out a piece of brass or iron like A, with the V-shaped edge. Now measure the depth of tooth of the pinion wire, and rivet the first piece of brass in between the saw blade on one side and the V-shaped

piece on the other side, *that is, the outside.* The F piece of brass represents the thickness of tooth of the pinion wire, and the V-edge piece of brass is to act as a gauge to give the width of tooth all through.

The piece of brass, F, is not so wide as the V-edge; simply to act as a gauge for the depth of tooth.

When all the teeth are cut with the saw and gauge, obtain a watchmaker's three-corner file to fit the space as near as you can, in between each tooth of pinion wire.

Fasten the rackwork down to a nice level piece of planed wood, and proceed to file the teeth (as shaped in sketch H) in straight strokes very carefully. It is not a long job, and, if carefully done, will amply repay any one for the trouble taken. When rivetting the pieces of brass to the saw blade be careful not to buckle the saw.

ON THE FADING OF SILVER PRINTS.

By A. L. Henderson.

'An unfortunate advantage.'

Here is a photographic rendering of the above adage. Having lately removed to a new residence, where I have a different supply of water, *i.e.*, permanently hard well water, for a time my photographic operations were completely upset in consequence of the water. Gelatine prints would fade before my eyes. This fact led me to theorise and experiment. The results will go a long way to account for the fading of prints. For example, if I take a gelatine print directly out of a compound toning bath, and place it in a fresh fixing bath, it will speedily darken in tone, and the whites will get degraded. This is caused by a decomposition between the salts of the toning bath and the new hypo. If the print is well washed in pure water between the toning and new fixing, no apparent alteration takes place unless the hypo is too strong. Here there is a probable explanation why some prints fade more than others. I don't want your readers to think that this peculiarity is due solely to the double toning and fixing bath.

I believe that the bath just named is the best of all known methods when properly used.

Moral: Use pure water for all operations. If not, use a small quantity of pure water before and after each operation. This latter procedure will remove the bulk of injurious chemicals.

THE SKYLIGHT AND "THE JOURNAL."

By W. Girling.

Seeing the numerous answers to correspondents requiring advice upon studio building during the past summer, which have appeared in the Journal, I judge the erection of such buildings is on the increase.

Having worked in one for more than thirty years, and been indebted to writers who related their experiences in former year-books, I will, with your permission, give a few plain directions upon the best plan of keeping out the wet—a very important matter.

The pitch of the roof, all things being considered, should be at an angle of 45° ; this shoots the water best, is easier to repair than more upright ones, stronger than flatter roofs, will give more light, and be better under control. The space between the rafters should not be less than twelve inches, and need not be more than eighteen. Greater breadths require stronger rafters ; thicker and more expensive glass. The most economical pane is one third longer than the width.

When contemplating building, altering, or repairing the lights, the edges of the glass next the rafters, both above and below, should, a week beforehand, be painted ; any colour will do, using boiled oil ; let this get dry before using, see that the outer edge is covered also a quarter of an inch on the pane, the putty will then adhere firmly to the glass. This should be made of linseed oil, not fish oil, the builder will tell you the latter is as good as the former, and we always use it, &c. Do not believe him ; *price* is at the bottom of such remarks.

The panes are best cut thus :—

If it be a foot wide, cut off a piece at each side five and a half inches long, half inch wide at the edge, tapering to a point towards the centre, leaving about an inch straight in the middle, this will cause the water to run down the centre and away from the rafters. Bevel the inside edge of the rafters. Let the rabbets be well painted and dried, and not less than three quarters of an inch deep, otherwise you will not have sufficient space for the putty when you reach the top. Before putting the glass in position, have in readiness some strips of zinc one and a half inches long, quarter wide, fold them in half, then, with a pair of pincers, bend the end over one sixteenth of an inch to form a little hook to hang on the top edge of the first pane at each side ; spread the putty on the rabbets, let it be tacky, lay the pane in position with a brad at the bottom to prevent slipping, put on the hooks and proceed with the second pane, let the slanting edge cover at least half inch of the first pane, this air space serves for ventilation, cleaning, carrying off the water of condensation within, and prevents the water ascending by capillary attraction ; finish off with good putty, and let it be painted before it gets dry—this makes it adhere to the glass more firmly. The end of May is the best time for this work ; go over it again in the middle of August, filling up any crack with putty and paint, and you will be safe for the winter. Let the light have these two visits annually in dry weather—it is the most economical plan. See to this personally yourself. It is your light, you have to pay, and it is for your comfort. The workman will say "All right, sir, I understand." So he may, but frequently you find something not quite right ; a crevice or two into which a pen-knife will go, and the wet too.

Should the light be too strong for your work, coat it with oiled tissue paper, as Mr. Blanchard suggested last year, I prefer it on the outside. The hail-stones do not damage the glass so much ; it is cooler in summer and warmer in winter. The light is soft, nicely diffused, and of good quality.

The British Journal of Photography.

First, there *is* such a thing in existence ; second, take it ; third, read it ; fourth, lend it to some one who cannot buy it.

Last spring I sent my assistant to a west-end emporium for a certain article, and he was told they knew nothing of it ; a like answer was given

at a second one, and yet it was prominently and frequently advertised in the Journal; evidently the young men do not read it, perhaps do not see it, or any other. Now, would it not be well if employers placed it within reach of their young people after business hours? I like to be served by one who thoroughly understands his business, which cannot be done by uninformed persons, it is also much better for the employers.

I look upon the appearance of the Journal as a regular weekly treat. I receive it on Fridays six p.m. After finishing the day's business, I sit down for rest and a comfortable read. It is always interesting, very instructive; often I read articles upon subjects I want to know a little more about, and not infrequently very amusing.

I look at the portraits in the Convention group and identify some of the contributors. What old friends some of them are now, others are like a good picture. You wonder what is going on round the corner; so we wonder who is Mr. Cosmos—what is he like; Free Lance, and Dogberry, with his frisky barking ways; and the writer of the delightful letters to Richard; and a host of other good names you see in the reports of Society meetings. This, and much more, is to be got out of the Journal It grows upon acquaintance; the more you read it, the more you value it. I would strongly recommend every one who practices photography to take it regularly; it will give good interest in every way you look at the subject. Probably the Almanac goes where the Journal does not, hence 'this thusness,' as Artemus Ward used to say.

Plate Backing—Fog Removing.

In *practice*, the usual sienna and caramel backing answers well. Pour off the liquid, dry the sediment, then take a little of the latter in a saucer, pour on some methylated alcohol, and with a brush paint over the back of the plates; never mind the streaks but *cover* the plate, a thin coating will answer; it dries quickly, does not rub off, and is easily removed with a wet sponge.

This will also prevent the plates from being fogged at the back during changing operations, a slight fog from light reaching the front may be removed by bleaching with chromic acid as given in the Almanac. When well washed, redevelop it to the required density with the usual developer employed.

A COMBINATION DODGE.

By Rev. T. Perkins.

Many of us would like at times to turn out a picture larger than the size of the camera we possess, and this we can, in certain cases, do without resorting to enlarging from the negative, a process which requires apparatus that perhaps we may not have.

There are certain subjects which make admirable pictures when arranged on a plate used upright, the lower half being occupied by the landscape, the upper by the sky. Any one who has seen Mr. Horsley Hinton's *Day's Awakening* and *Day's Decline* will know the kind of subject to which I allude. No terrestrial object in such pictures rises far above the horizon, and it is evident that the lower half might be taken

on a plate placed horizontally in the camera, the lens being lowered by means of the rising and falling front till the horizon is nearly at the top of the plate, only a strip of sky some half-inch wide being included. When this exposure has been made, should the sky be one suitable for the subject, the lens can be raised so that the horizon is brought within about half an inch from the bottom of the plate, all the rest being occupied by sky and clouds, the same lens and probably the same or a larger stop being used, and a shutter exposure being given so that the sky negative may not be overdone. Should, however, the sky not be suitable, a sky negative may be made on another occasion in the same manner.

When the two negatives are secured, it remains only to make the print. A printing frame somewhat larger than twice the size of the negative must be used, either one of the box form or one of the ordinary form, in which a sheet of glass has been placed for the negative to rest on; a 10×8 printing frame will do admirably if the negatives are of half-plate size. A sheet of paper of the desired size must be placed on the landscape negative, the upper part being carefully marked down to the horizon, and the landscape printed on this; then the sky may in like manner be printed from the sky negative, the landscape already printed being shielded from the light.

All cameras are made with a rising front, so no difficulty will be met with in getting the plate intended for the sky portion of the picture almost entirely occupied by the sky; but many cameras, my own included, do not admit of the lens being lowered. To obviate this difficulty, I always have the front board so pierced for the lens flange that the lens, when the front board is in its normal position, is decidedly above the centre, so that by taking out the front and turning it upside down the lens will be brought below the centre, and, if the axis of the lens is kept horizontal, the horizon will be high up on the plate.

NEGATIVES WITH CLEAR GLASS, EXPOSURE TABLES, AND 'REVERSALS.'

By F. H. Varley.

The above heading seems somewhat mixed, if not meandering; but I mean to go through with it as straight as the trajectory of a Bisley bullet busily buzzing on to the bull's-eye (to use a phrase inspired by a stay in the military port.) Down at Hythe, about a mile from the seashore, negatives with clear glass in the darkest shadows, full of detail from foreground to clouds, can be obtained from short exposures and correct developments. I say short exposures advisedly, because a series of four negatives, taken in rapid succession—one, the $\frac{1}{16}$ of a second; second, the $\frac{1}{32}$ of a second; third, $\frac{1}{64}$ of a second; and, fourth, $\frac{1}{100}$ of a second; all of the same subject, the lighting of the landscape being unchanged—yielded, under development, four negatives of remarkable uniformity, with the exception that the $\frac{1}{16}$ of a second and the $\frac{1}{100}$ of a second's exposure were a little nearer alike in density and detail; so this leads one to the conclusion that it is development that does it, or, rather I should say, the correct judgment and manipulation of the operator.

The *modus operandi* is something like the following: For success use

a developer of normal strength (soda pyro for preference), and stick to it 'in spite of all temptation;" learn what you really can do with it — the first appearance of any developed image (down here) is from fifteen to twenty-five seconds; with the same developer and same make of plate in London, from thirty-five to fifty seconds. I think the extra rapidity of development at Hythe is due to moist salt air. Complete development is reached in about two and a half to three times the first appearance; but do not trust to time measurements, but watch carefully the progress until all but the very darkest shadows are developed. At the very faintest hint that these are about to veil, smartly immerse the plate in the alum bath and arrest further action; after resting in the alum bath for a minute, remove it to a second alum bath, in which let it remain two or three minutes; then well wash and put it into the fixing solution; when left sufficient time to thoroughly clear, wash for two hours in running water. The resultant negative will be a quick printer, and those who work with denser negatives will be surprised how very rich these negatives are in the proper graduation of the whole range of tones.

Exposure Tables.—Now, from the fact of the range of exposure being a bit wide, I was led to place some confidence in an exposure table. Accordingly, turning to September, I found that for f·14, 'Three o'clock afternoon, open landscape, with sunshine, forty times plate' (whatever that may mean), time of exposure is given at $\frac{1}{4}$ of a second. Having a shutter which is speeded to the $\frac{1}{25}$ of a second, I set out to photograph St. Leonard's Church, as seen over the fields, camera facing eastward, also to get two views much nearer of the same church. On development of No. 1, to my surprise, first appearance began at ten seconds and the whole flashed rapidly into view. Naturally thinking that the darkened portion of the negative was the sky, I looked out for what I thought land and foreground; just when it was too late (forty seconds in the developer) I discovered it was a reversed negative. The sky now had darkened; I then arrested development with the alum bath; had I have removed it at thirty seconds, I believe I should have had a perfect diapositive; but the result, after all, is even more interesting, for, after bringing the reversed image, it has made a feeble attempt to recover itself and to behave as all well-regulated and properly conducted negatives should do. The result is a positive and negative superposed, this being especially observable in the case of the trees; the tops, the most lighted, remain reversed, whilst the centre, shadows, and stems are more negative, and between these all is muddled and mixed. So much for exposure tables. You can pretty well judge the amount of faith I am inclined to place in them when one sixth of the time they tell you produces a reversal.

Two days later I went, accompanied by my nephew, to photograph the breakers as they dashed against the sea wall at Sandgate. We were armed with a half-plate hand camera, with twin lens and brilliant full-size view-finder.

In the enthusiasm of the work I directed the camera westward, and took two pictures. It was whilst waiting and watching for a good display I became so engrossed as to allow the sun's image, mirrored by the waves into hundreds of gleaming facets, full play upon my eyes. Result, a martyr to the cause of science, a bad attack of ophthalmia, accompanied with neuralgia, *hors de combat* for three weeks.

Moral.—Never use brilliant full-size view-finder twin-lens cameras without tinted spectacles, lest, in an unwary moment, one should be led to do the same kind of foolish trick. I, however, still consider the makers of these instruments very much to blame in not cautioning users, or, better still, to supply a blue or dark-tinted glass screen for use on similar occasions, or when photographing snow or white chalk cliffs reflecting a dazzling brilliancy of light.

Twelve views were taken in all. The camera shutter was timed for $\frac{1}{80}$ of a second, the remaining ten being taken by my nephew. The negatives all show reversals, or partial reversals, though 'Ordinary' plates were used, the white spray printing out like smoke or dust, and in this respect there is scarcely any difference between the negatives taken with camera facing east or facing west. Facing west the spray obscures the light, and should look dark, but, with camera facing east, the spray was of a snowy whiteness, the sun being in the south-west; nevertheless, the spray prints out even darker, due to the effect of reversal.

A TRIP TO THE PYRENEES.

By Major C. Gardner Vatcher.

Last spring we went over part of the ground we had previously visited, namely, Biarritz and its environs. From thence we made our way to the Pyrenees. Passing Pau and Lourdes, we arrived at Argeles, which we made our headquarters. The scenery is lovely and the climate is delightful. We were there at the beginning of April, and the snow had not quite cleared off the mountains, but the trees in the valley were in full leaf.

Amongst the many things to see and photograph are the ruins of several castles, said to be built by, or occupied by, our Black Prince. The castles of Beaucens and Luz are the finest, and they are perched on the tops of conical hills, of course at some distance from each other. Each is built to command that particular part of the valley, and the means of access to them is difficult and well guarded, there being sheer cliff all round except at the entrance.

On our way thither our driver was put through his paces as to who the Black Prince was, and his history was like that of Bill Adams, new and startling. For instance, he was called Black because he was a nigger. His antagonists were whites, and he lived about hundred years ago, or about the time of the great Revolution.

Quite close to Argeles is the small village of St. Savin, picturesquely situated at the top of a hill, and where there are several things worth a plate, such as an old church, a fountain, and some old buildings. There are several nice walks into the mountains, but the river scenery especially took my fancy. One drive we took, *viâ* a small place called Pierrefitte, was to Cauterets, a sulphur-bathing station, much patronised by the French in summer for skin diseases. It lies in a hollow at the foot of some mountains some 1500 feet above Argeles. So shut in is it that very little sun seems to shine there, and, when we were there, seemed particularly depressing, as the long, narrow streets were void of

life and the shops were shut up. The road up was very fine, and at every bend for some distance one caught glimpses of the Argeles valley. Like most of the French mountain roads, it was cut out of the mountain side, and is well engineered. The gorge down which the Gave de Cauterets roared was very grand. On the way up is a silver mine, with some wonderful machinery now going to wreck and ruin, as the Company, said to be an English one, do not now work it, as silver is so low.

Another drive we took to the famous Cirque de Gavarnie, going up one day and returning the next Part of the way is over the same road as to Cauterets, through Pierrefitte. The valley narrows just after this place, and the road is cut out of the cliff side, with the river at its right, and the cliff again bounding the river; but just before Luz the valley widens again. The cliffs all along the road tower above one.

At Luz there is a remarkable church, said to have been founded about the twelfth century by the Templars. It is peculiar in that it is fortified and surrounded by regular defensive works. A small chapel, cut off from the rest of the church, was said to be for the lepers, of whom there were said to be a large colony in those days. The Romanesque porch is well worth a photograph. One of the two towers served as a kind of keep, whence the watchmen on guard could see the approach of their enemies. From Luz the road leads past St. Sauveur, another thermal station, consisting of a long winding street, to which the French resort in summer. The gorge is crossed by a very fine bridge just above the village, the river being some hundreds of feet below. Further on, several villages are passed, quaintly perched on promontories above the road. The last small one before Gavarnie rejoices in the name of Gedre, and is usually made a resting-place for the poor horses. There is really nothing to see there, and, although they pretend to have a wonderful grotto to show you, it is only an attempt on your pocket. The last mile of the road leads past what is rightly called Chaos, that is to say, what one's ideas would lead chaos to have been. Part of the mountain-side has dropped, and huge blocks of stone almost as big as houses lie piled one on top of each other, or so poised that one would think it would take very little to bring the whole lot hurtling down on top of you. Of course the famous Roland has left his mark here as in other parts of the Pyrenees. You are shown his horse's footmarks imprinted in the rock after having leaped from the top of the mountain. The Breche de Roland, so tradition says, was hewn in the mountain by one cut of his sword in order to get quickly from Spain into France. We now get a first view of the Cirque, in form a big horseshoe, with three terraces, each rising a thousand feet above the one below.

As soon as we got to the hotel we could see that, save in big heaps, the result of winter drifts, the snow had all melted, but they told us that, although on most of the mountains around the snow was all melted by summer-time, yet there were always unmelted glaciers on the terraces of the Cirque. Luckily, as soon as I had made all the arrangements for our stay, I made my way up to the foot of the Cirque, and saw nearly all there was to see, but the other members of my party delayed till the next day, with the result that all they saw was from the carriage when coming up. Soon after we had started dinner it commenced to sleet, and turned in bitterly cold, so that we were very glad to have good fires

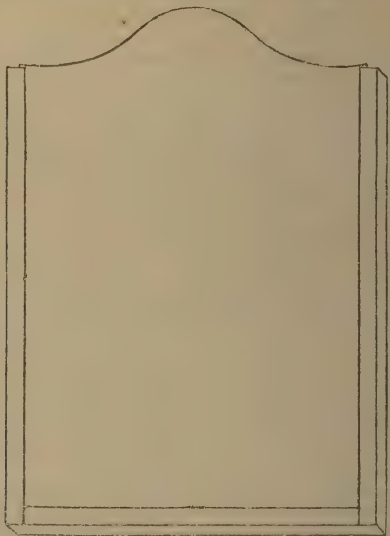
in our rooms, and all the wraps we could on our beds. The next morning the ground was white with snow, and it did not cease snowing till after our journey half way to Argeles, and by the time we got there it got quite fine again.

Altogether, I spent a very jolly time of it, and brought home lots of plates developing into very successful negatives, and can thoroughly recommend a trip to the Pyrenees.

HOW TO MAKE METAL SHEATHS.

By John Ross.

Shape out a piece of sheet iron or brass the size of negative, the sheaths to be constructed for. Obtain from Fallowfield's a ferrotype plate, and mark out on the ferrotype plate the size the sheath is to be, allowing half an inch, both in length and breadth of sheath, than the brass plate for turning



over. Now proceed to turn over the edges all round (except the top part for the insertion of the dry plate) the brass or iron plate. When the edges are turned down, get a piece of very hard wood, and lay down on the edges of sheath, and beat down with hammer.

The sheath, with the plate extracted, should appear nice and flat, like sketch.

AN EGG SHELL USED AS A PARABOLIC REFLECTOR.

R. L. Maddox, Hon. Fellow R.M.S., Hon. Member Amer. M.S., &c.

For more than a year this particular egg-shell had been saved, trusting some day to test its value as a quasi parabolic reflector, and now forms the subject of the present contribution in answer to the Editor's appeal. To state that this is the first time an empty egg shell has been put to such use would be to hazard contradiction, hence that point can be waived.

An old egg-shell is rather a ticklish object to shape for adaptation to a microscope objective, but it was accomplished after the following manner. A circular piece of stout brown paper, and also of fine black cloth, had each a hole punched out of the centre, the size of the front of the brass-work of the objective to be used; each piece was then deeply notched from the outer edge towards the central opening. A circle was now drawn on the outside at the end of the shell, and of the same size as the hole in the paper and cloth. After well wetting the brown paper and damping off, some strong glue was spread on one side, and it was then placed on the shell, the circle and aperture coinciding. The cloth with its lappets was then put on over the paper in the same way, and both were allowed to dry on the shell. A central aperture had now to be pierced in the shell, and its outer edge cut down; the latter was managed by carefully snipping the edge away to the required amount. The shell was next held up to the light, and a pencil outline of the outer circle made on the inside of the shell. With a small drill, holes were then made all round just within this circle, and the central piece pushed out; the edges were finally smoothed off with a straight half-round file, and finished by a fine rat-tail file, so as just to admit the nose of the objective.

It now remained to fix a tube to the protected shell, so that the little reflector might slide on the tube of the objective A strip of stiff paper was rolled round the tube of the object glass and glued up, so as to form a stoutish tube, and allowed to dry on it. When dry, a pencil line was marked round the tube midway, and the front edge notched to the depth of this line; the little leaflets were then pressed back over the rounded end of the handle of a large chisel, and thus forced open equally. They were then smeared with glue on the inside, and fitted on over the outer coverings on the shell, the objective being pushed into this paper tube, and its front allowed to just project centrally through the circular aperture made in the shell, and the whole allowed to dry.

On testing this arrangement on a small object, it was found necessary to remove more of the outer edge of the shell, so that, when in focus, the shell should just touch the slide on which the object was to be mounted. Two small circles of black paper were fixed to the centre of an ordinary glass slide opposite each other, one on the upper, the other on the lower surface, to form a dark background; the object, a small brittle star—*Ophiocoma neglecta?*—being centrally attached to the upper black disc by a tiny touch of gum. Unfortunately, in spite of every care in placing it down by using the tip of a fine feather—forceps being out of the question—so brittle was the dried skeleton that many of the minute calcareous particles became accidentally detached, and remained adhering to the surface of the paper, consequently they show in the negative.

The little reflector being ready it remained to test it; hence the microscope was placed in position, and a quarter-plate camera attached at the eye end, daylight being reflected from the plane mirror. The whole apparatus, except the mirror, was now covered with black velvet, but the definition of the image on the greyed glass appeared scarcely satisfactory. Direct sunlight was next tried, but from the position of the arrangement it had to be reflected from a secondary mirror, with ball and socket joint, on to the microscope mirror. The eye-piece was removed, and the image again carefully focussed. An ordinary plate was then placed in the slide, and an exposure of thirty seconds given. The image was very slow to appear under development, but when fixed and washed gave a really fair negative, considering the rough centering and the method employed. It was found advantageous to entirely exclude all stray light from the one inch objective, which was used in the experiment, and naturally the same objection would apply to this device as applies to the ordinary highly-polished metal parabolic speculum, that shadows are not well marked; this, however, is often obviated by covering half the speculum with black paper, which might also be done in this case.

DEVELOPING CINEMATOGRAPH FILMS.

By E. A. Robins.

As fairly cheap machines are now upon the market for taking and projecting the 'animated pictures,' a few hints on their development may be found useful. Make a rectangular frame of hard wood, 18 inches by 21 inches by 2 inches, and well soak in paraffin wax. This will take a 40 feet film of Edison's standard size wound spirally upon it, the ends being fastened by drawing pins. This is placed in an ordinary deep dish, the film being prevented from touching by means of small blocks at the ends. The following developing solution has been found to answer very well for most films upon the market, and can be recommended:—

Metol	400 grains.
Hydrokinone	400 ,,
Sodium sulphite	12 ounces.
Sodium carbonate	8 ,,
Potassium bromide	140 grains.
Water	240 ounces.

The above can be used over and over again if, between times, it be kept in a stoppered bottle. If the developer acts too rapidly, dilute with water; but do not prolong development, as stain and fog must be avoided at all costs, a bright negative inclining to hardness being most desirable. The film may be left upon the frame through all the usual operations, and is very convenient to handle. Fix in 20 per cent. hypo and well wash, and before drying soak for a few minutes in a 4 per cent. solution of glycerine, to prevent the film drying horny. Development can be carried out by soaking the film in water, and then placing in a dish in half the developer and having another containing the remainder, the film being passed from one to the other alternately. This is simple, but is liable to lead to damage

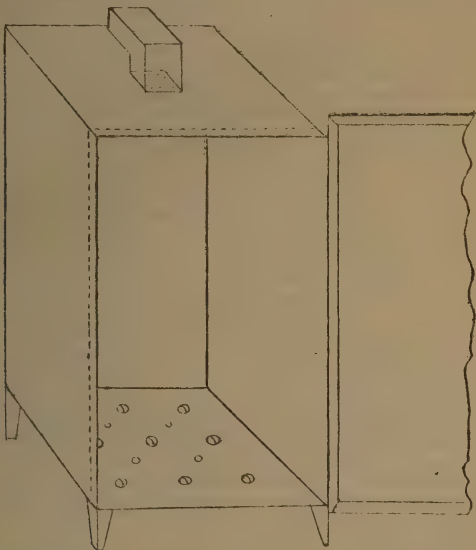
of the film. Intensification and reduction can also be carried out on the same frame, mercuric chloride for bleaching and ordinary developer for blackening being most recommended, and the ordinary ferricyanide reducer.

CARBON TISSUE DRYING BOX.

By Geo. W. Valentine.

One of the greatest obstacles to the carbon process in sensitising the material at home is some simple means of drying the tissue in a satisfactory manner in a few hours. Here is the way then.

Construct a box with light-tight lid, as per sketch, the bottom to have four pieces nailed on the bottom at the corners to raise it off the ground,



so that plenty of air can get in through the air-holes, as illustrated. Sensitise and squeegee the tissue to thin slabs of vulcanite or polished plate, and hang on lines tightly stretched across from side of the interior of box; or some narrow shelves can be formed on the sides and back of the drying box, according to the worker's ideas and requirements. When full, close the door, and in five or six hours the tissue will be ready to strip.

The elbow ventilator on the top explains itself. This box answers capitally for drying bromide prints.

IN QUEST OF AN X RAY.

By W. Mathews.

Viewed from the standpoint of an uninitiated novice, it would certainly appear that the one all-important and indispensable adjunct for the evolution of an X ray is a Crookes' tube. Yet, upon more mature reflection, it commends itself to the front as an open question, whether, in Nature's laboratory, and in some more or less potential form, an X ray has not also an independent and normal existence. Might it not, presumably, be evolved, or its presence demonstrated as an actual function, or as a constituent element of ordinary sunlight? Ought it not to be experimentally sustainable, affirmatively or negatively, that these rays operate universally as a primordial element of light; or are they but an artistic creation, which has now, for the first time, originated potentialities which were previously non-existent?

It might be—it is fairly possible—that an X ray is but a manufactured article—an evolution of penetrative activity due to the virtues of this especial apparatus. This would relegate an X ray to much the same category as some other manufactured article, to wit, a soap—an artistic *combination* of fatty acids with alkaline or metallic salts. But is it, in this sense of the term, a manufactured article; or, is it not, rather, a natural element of light, as oxygen, for example, is a natural element of the atmospheric air? Is it in the main an artificial product, or is it not such another constituent of light as those which were revealed to the first experimenter with the refrangible properties of a glass prism, when the white sunlight was first observantly dissevered into the three primary colours? That is the nature of the issue here raised.

There is an intrinsic improbability in the surmise that, until projected from a Crookes' tube, the X ray does not exist. More reasonable is the surmise that, more or less potentially, it operates as a function or else as an element of the sun waves everywhere. Nevertheless, that the energy of an X ray is greatly enhanced by the intervention of a Crookes' tube, might go without saying.

Shall we not assume, then, as the more rational hypothesis, that an X ray is an intrinsic constituent of light, and is qualified to exert its power wherever the conditions are sufficiently conformable. If such be the case, we may look for results more or less pronounced whenever the proper concomitants of X-ray activity are present. If it cannot reasonably be held that these rays are special to a Crookes' tube only, then, doubtless, they are performing some function, or making their influence felt in a hundred ways yet to be traced out.

In any case—whether operating universally, or whether local to the Crookes' tube in particular—nothing need here be said explicitly of their primal nature and origination. There are questions concerning the differing velocities of wave motion—and which differing velocities, it is alleged, constitute the real source of certain differing activities—as those which subsist between light and electricity, and, not unlikely, of the X ray. Differing velocities may account for much, but it would be too feebly narrowing the inquiry to be content to attribute the whole phenomena to that one explanatory *dictum*. A differentiated velocity might possibly be an ultimate fact connected with the origin of the

X rays. But the hypothesis in no way helps to solve the question of their everywhere potentiality—*minus* the intervention of a Crookes' apparatus.

And, again, if it be really one of the essential elements of sunlight, the interesting inquiry before us is this. To what extent, and by what means, might it be educed and isolated? Who will discover for us a prism that will accomplish that for the X ray that a crystal prism does for the primary colours and for spectrum analysis—a prism, to wit, that will discriminate between the differing velocities, and refract them into their natural sequence upon, perhaps, an efflorescent screen? Yet, mayhap, a Crookes' tube is the sole equivalent of such a prism.

But, in the interim of such an appliance being forthcoming, where shall we turn to trace out the possible—the normal operations of the mystic rays?

The action of sunlight, considered merely as an ordinary effluence, is known to us all, and is everywhere visible—in the vegetable world, in the studio of the photographer, and in the laboratory of the chemist. But, in the *arcanum* of Nature, it would seem to be but a little less essential that there should be also a more potent and penetrative agency—an agency that diving beneath cutaneous surfaces, would awaken vitality in wombs, and ova, and interiors that are inaccessible to unassisted daylight.

It may aid us in our quest to note some ascertained result of the X-ray activity when it is projected from a Crookes' tube; and, as an apt illustration of what an X ray can do physiologically, nothing can be more suggestive than the disagreeable experience of a practical expert, whose frequently occurring exposure to the ray culminated in results that he had good cause to remember. In the pages of *Nature* he fully detailed what had happened to him. Upon the parts affected by the rays the effect was such that the cuticle scaled off to an alarming extent, and even the finger nails were similarly affected, and ultimately came away also.

Arising out of the novel experience of this well-qualified observer, an obvious suggestion presents itself. It is, that in the realm of natural history the X ray is in potential attendance upon those members of the animal world who are in the habitual practice of shedding their integuments and periodically parting with their cuticles.

Desquamation, when originating in disease, is an unsightly and unwelcome superfluity; but, to the family of crustaceans and of various reptiles, it is a frequent and periodic necessity. To admit of their expansion into the adult stage, it is necessary that the crustacean should from time to time divest himself of his coat of mail. Volition or instinct would be wholly incapable factors in the matter unless adventitious aid came to the assistance of the creature. The X ray, as we have seen, is sufficiently potent to bring about the needed result, and with the *minimum* of inconvenience enable the crustacean to rid himself of his old suit. It is significant, too, that with certain of the reptile class even the outer coating of the eye is thus shed, and that, until the operation is completed, partial blindness ensues; and it is here scarcely possible to refrain from the suggestion that, in instances not a few among persons who are blind, the mere intervention of an opaque film might be the sole source of the mischief. To such persons the desquamation that might be effected by an exposure to the rays of a Crookes' tube should prove to be an efficient remedy.

But, to return, do we not find here food for reflection? These inhabitants of the animal world that thus habitually desquamate their skins and, so to speak, their finger nails, do they not derive assistance from the normal action of an X ray? Crocodiles, lizards, vipers, and crustaceans generally, walk out of their skins with comparative facility. Are, then, their hides more permeable or less permeable to the X ray than those whose skins are not habitually shed? When a snake wriggles out of its corselet, or an armadillo throws off his coat of mail, do we not witness an apt illustration of the normal action of the rays?

Again, if we turn to the vegetable world, is it not a reasonable possibility that the subtle influence of the X rays are in request in the due development of all endogenous plants and trees? Of this class are the palms, the growth of the boles and stems of which proceed from the interior, and not by additions upon the outside, as in the other instances of tree life.

Yet, not unduly to prolong our quest, which, after all, is but of a tentative nature, for a moment let the matter of halation be considered. This should be a topic coming right home to every photographer. But every photographer is, in this regard, somewhat ostentatiously his own oracle. All that the writer can do is to raise the inquiry, whether it has ever occurred, to those who in the past have dealt with the matter of halation in these pages, that possibly the X rays, in their normal capacity, are frequent factors in the case? The hypothesis is one that lends itself to crucial examination, and it should not be difficult to determine whether these penetrative searchlight rays have not played a part in many a vexatious episode to which halation has given rise. Following upon an investigation of that nature would be a quest for some well-adapted material for the more effective isolation of sensitised films and surfaces, a material that should be practically impregnable to the unwelcome visitant.

AVEC M. JACQUES CRAPAUD.

By Wilford F. Field.

How Time heals all wounds! I had long ago a sneaking affection for the picturesque side of *La Belle France* and of M. Jaques Crapaud—a very charming fellow, despite the little affair at Waterloo. And so, with a few weeks at command, I recently hied away to enjoy a holiday, accompanied by my faithful Kodak, which is growing dilapidated with age, but is still a reliable *compagnon de voyage*, yielding pictures of which many a good story could be told.

Selecting the L. B. & S. C. Company's route, which is to be preferred for comfort, I journeyed from Newhaven to Dieppe. Coming into the port in daylight, one is struck with the picture unfolded. It is delightful —it is beautiful. And once at Dieppe, that merry little Kodak was constantly busy, for there is no end to the pretty things to be picked up. On the beach you will find marine studies galore; or, be you a student of the 'altogether,' you will find it here. The artist who loves his Latin Quartier (alas! how little is left) will be found busy here, for the *toillettes des bains* are ravishingly pretty, and Mrs. Grundy sleeps!

On the little river Arques there are some fine views to be had, and the

Casino forms a capital picture. The streets are mostly modern, but here and there, in quiet corners, are relics of the old Hugenots, and history is reminiscent at every step. And, being with Jacques Crapaud, one must go to the Camp of Cæsar, above Puys—reserve half a dozen films. Nor must we neglect the crumbling battlements of Gizors, and if Dieppe is crowded one can spend a pleasant time at Pourville at a ridiculous outlay. It is a roundabout railway journey from Dieppe to St. Valery, and the pedestrian will certainly get the best of it. Then we tramp on to Fecamp, where one can sip the original Benedictine and watch the bathers.

Etratat is only ten miles by coach, and it would be idle to predict how long one will stay. A splendid picture of the town can be had from a rowing boat, and life is altogether very enjoyable here. Not far away is Trouville, where the photographer will find his stock of films does not last for ever. Everything is gay, frivolous, and fanciful at Trouville. Ouida paints truly; see here for yourself, and yet we prefer it to the dull monotony of English resorts we could name. Any pictures to be had? Bless you, sir, they abound? We can get Corneville (the bells ring not as tunefully as in the opera), or we can sojourn at Hèbertot, or Cabourg, or Bagnoles-les-Eaux. Your camera will never be idle. I confess it—*La Belle France* is incomparable! *Bon voyage, m'sieu!*

QUALITY AND PERMANENCE IN GELATINE LANTERN SLIDES.

By John A. Hodges.

The gelatino-bromide process and its modifications may now be said to have established itself among those processes which are regarded as specially applicable to the production of lantern-slides; but, although the quality of many of the slides so produced is by no means all that could be desired, I do not agree with the ultra-conservative opinions held by some, that slides so made never exhibit the high technical qualities usually associated with older methods of working, for I believe that, upon the screen, a *properly made* gelatine lantern slide will not only hold its own in any company, but will be practically indistinguishable from others produced by those processes which are said to be peculiarly suitable for lantern-slide work.

Taking the collodio-bromide process as the standard of excellence (for albumen may be disregarded from the practical point of view on account of the tedious and difficult nature of the process), I have no hesitation in expressing the opinion that upon a *suitable* plate, and with *proper* treatment in exposure and development, slides of equal technical quality can be readily produced. In one direction, however, and this a very important one, namely, permanence, collodion undoubtedly has the advantage, for, unless toned with mercury, slides by the latter process seem to undergo no change; but, unfortunately, the same cannot be said of gelatine, for, even when the very greatest care has been exercised, the slides will sometimes change or deteriorate. To minimise the risk of fading due precautions should be taken, and my own experience has taught me that gelatine lantern slides should always be stored in a dry

place, for continual exposure to a damp atmosphere seems to have a very prejudicial effect, certain slides subjected to such conditions having obviously deteriorated, whilst in the case of others, made at the same time but stored in a warm, dry cupboard, no change is apparent.

When one remembers the hygroscopic nature of gelatine and the intense heat to which a slide is subjected in the lantern, it is obvious that the introduction of another and unnecessary condition may be attended with disastrous results. It would seem to be desirable to, as far as possible, counteract this hygroscopic tendency, and to this end a final soaking, before drying, in a dilute solution of formalin might be attended with a beneficial result. Moreover, the ordinary method of binding affords but little protection to a slide from the evil effects of a damp atmosphere, and it is well, in addition to varnishing the slide, to go to the extra trouble of first sizing, and then varnishing, the binding strips and edges of the slide; after binding, both size and varnish can readily be applied with a small camel's-hair brush; a slide so treated will be practically impervious to moisture.

But it is little use taking these precautions in the final treatment of the slide if it has not been properly fixed and washed. Many lantern-slide plates appear to fix very quickly, and consequently sufficient time in the fixing bath is often not allowed. Two fixing baths freshly prepared should be used, and five minutes allowed in each. Each slide should be washed under the tap for two or three minutes, and then for an hour in a dish or tank with running water. Slides so prepared will not be likely to prove impermanent through the imperfect elimination of hypo or the formation of indefinite or complex changes in the film itself.

Reverting to the conditions which are essential to quality, it is necessary that a suitable plate be chosen. To the unobservant eye there may not appear to be much difference between the numerous commercial brands of lantern plates now obtainable, but to the more discriminating the difference is very great. It is impossible, within the limits of an article in the ALMANAC, to go into minute details, therefore I can only indicate the conditions under which the most successful results will be obtained. A slow plate is an absolute necessity: any attempt to quicken a lantern emulsion must be attended with a loss of quality. The slower the emulsion, the finer the deposit and the less the tendency to granulation. A quick lantern plate is very undesirable; indeed, the finest slides producible on gelatine are only to be obtained on chloride plates, and these, when properly developed, cannot be excelled in technical qualities by any of the older methods of working, and almost equally good are the bromo-chloride plates made by several makers.

It will not be easy to produce a coarse-grained image upon a plate of the character I have indicated; but, nevertheless, if the highest technical standard of excellence is desired, attention must be paid to exposure and development. We may give the same gelatine lantern plate either two seconds or a quarter of an hour's exposure, and with different systems of development good slides may be obtained in both cases. But the character of the deposit forming the image will be very different; in the one case we shall have a warm-coloured image of great delicacy and with an entire absence of grain, and in the other a very slight degree of magnification will reveal the comparative coarseness of the deposit.

Short exposures and quick development with strong solutions are incompatible with the finest technical perfection in lantern-slide work on gelatine plates, which indeed will only be attained when the procedure indicated has been followed, namely, the use of a slow plate, to which a full exposure has been given, followed by development with a weak and fully restrained developer. Worked on such lines, the gelatine process may be confidently recommended to the attention of lantern-slide makers who are ambitious of obtaining the acme of technical perfection.

THE INFLUENCE OF BACKED PLATES UPON THE TIME OF EXPOSURE.

By Hector Maclean, F.G.S., F.R.P.S., &c.

Although most practitioners are by this time sufficiently familiar with the chief cause of halation, and with its chief cure, there are one or two secondary effects produced by using backed, in the place of unbacked, plates, which many photographers may easily have overlooked, but which they will do well to bear in mind. Of the aforesaid consequences, probably the most important is that which affects the duration of exposure. Many of us can remember how that, with the old wet plate, to which it was often impossible to afford a full measure of exposure, what was termed a supplementary exposure was given, *i.e.*, the plate was submitted for a brief period to the action of more or less subdued actinic light. The object of this was to slightly veil the half-lights and the half-shadows.

Opinions differed as to the wisdom or utility of this practice. Without entering into the merits of the question, it is enough that, much as this supplementary exposure modified the general scale of opacity with the wet-collodion plate, so, in the case of an unbacked dry plate, does—or should we say did?—halation affect the resulting image. Those actinic rays which, with a backed plate, become extinguished, are, with an unbacked one, in part reflected, and thereby exert an appreciable influence upon the resultant opacities of the negative. Although this influence is, without doubt, generally an unwholesome one, it at any rate reinforces the light action to an extent which is not always fully recognised. What the amount of this reinforcement may, under the most favourable circumstances, attain, may be gauged by the significant experimental researches lately made by Captain Colson, who demonstrated how the normal exposure of a dry plate may be substantially shortened by backing the sensitised film with a white substratum. Furthermore, support is given by citing the well-known fact that an emulsion spread upon paper is 'quicker' than the same upon ordinary glass, due to light which passes through the film being in one case reflected by the white paper, whilst, in the other, a considerable proportion passes through the glass, and becomes absorbed by the black backing of the dark slide.

Should any one have a doubt as to the importance of the supplementary exposure which an unbacked dry plate receives, let him back half of a plate, and thus expose it in a camera upon a landscape. On development, if the unbacked half presents an appearance consistent with correct exposure, the backed half will appear to be somewhat

under-exposed, the shadows and half-shadows refusing to fully respond to the reducing action of the developer, so that their detail and transparency are in a considerable degree ruined.

From the foregoing remarks it will be evident that a substantial increase in the normal amount of exposure needful for an unbacked plate is called for when a backed one is used. What is the precise amount of this increase remains to be fixed by comparison of the experiences of skilled photographers. From observations of my own work, and also that of others, during the past year, I should estimate the increase in exposure called for as not much less than fifty per cent. This, for the snap-shooter, is a serious prolongation of time, and will go far to make him chance halation in order that he may keep his fraction of a second as small as possible; but that such a policy is, nevertheless, an unwise one will, no doubt, be the unanimous opinion of the thoughtful specialist.

Some other consequences which follow the use of backed plates, and which the more ambitious 'pictorial photographer' would do well to bear in mind, must be held over for a future communication; if not to the delightful annual miscellany of up-to-date photographic information in which these lines appear, then to some less attractive publication.

SCIENCE AND ARTS.

By F. H. Burton.

Now that the smoke and din of the art *versus* science battle has somewhat subsided, it may be useful to take a brief survey of the field. We have had, on the one hand, writers so devoted to the scientific side of photography, that they have denied to the other branch any artistic possibilities whatever; while, on the other hand, we have had devotees of art comparing the intricate operations of exposure, development, &c., to the mechanical mixing of prepared colours on a painter's palette. That both contentions are equally wrong will, I think, be admitted by all who have kept outside the strife of the wordy contest; extreme views are rarely based on a solid foundation, and, as usual, the truth is probably midway between the disputants.

A photograph that violates the elementary rules of composition, however perfect technically, is a failure, and equally the finest composition may be ruined by faulty technique. For the production of the best class of work, the student must regard photography as both a science and an art intimately blended in one harmonious whole; it is not, and never will be exclusively either.

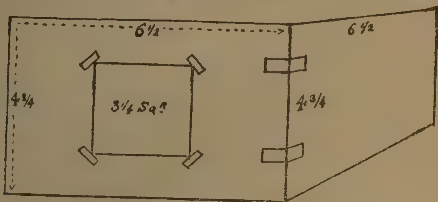
I would suggest to the elementary student that he first studies photography as a science, that he may learn the powers and the limitations of his materials, and when he has attained proficiency, to study lighting, composition, perspective; in a word art, with all the diligence and concentration he can command. Incompetent slovenly technique is not necessarily a proof of artistic capabilities, although we are sometimes asked to accept it as such; and equally the most perfect technique alone will not make pictures, or ever appeal to people of educated taste. The union of art and science is photographic strength. Don't divide them, let your work show a happy combination of both.

'DE MINIMIS.'

By F. J. Mortimer.

In response to the Editor's invitation to contribute to the pages of the evergrowing and evergreen Annual, I have succeeded in unearthing a much dog-eared note book, and, although perhaps the following extracts, taken at random from its pages, may not be startlingly original or new, they have at least the merit of being undoubtedly useful.

Good, serviceable, and cheap carriers for smaller plates in large, dark slides are to be made of stiff millboard. A piece of millboard $6\frac{1}{2} \times 4\frac{3}{4}$ inches, and about the average thickness of a plate, is taken, and an opening, $3\frac{1}{4}$ inches square (full), is clean cut in the centre with a sharp knife. A small strip of thin card is glued across each corner,



showing just sufficient, from the other side, to catch the corners of the plate; and a piece of card, also $6\frac{1}{2} \times 4\frac{3}{4}$ inches, is fastened to one end by linen hinges. The whole lot is then blackened by paint or ink, and the carrier is complete. When using, place the carrier face downwards, lift up the back card, place a plate in the opening, the little corners of card prevent it slipping through, shut up the back, and insert in dark slide as usual. Other sizes can, of course, be made the same way, and they cost less than a penny each—a cheap enough carrier surely.

Many photographers, especially amateurs like myself, keep and use old developers to obtain density occasionally. It will be found that a scum forms on old developer, and that wherever any particles of that scum attach themselves to the surface of the plate, they prevent action in those places, causing pinholes or big holes according to their size. The remedy is, of course, plain. Always filter old developers before using.

An excellent lantern-slide box can be made by obtaining a stout average-sized stay box from——Well, obtain a stout average-sized stay box, and line two of its opposite sides with that corrugated wrapping paper used when sending bottles through the post. This makes capital grooving, and a stay box is just about the right size to take a lantern plate, and will hold, dependent on the size of the grooving, about fifty slides. This grooving can also be used for larger plates in larger boxes, and costs next to nothing.

A very good matt varnish is to be made by adding a little tartaric acid to ordinary negative varnish, and an equally good retouching surface can be secured by beating up the white of an egg to a froth; let it settle, and add ten ounces of distilled water and four drops of ammonia, and flow over negative before drying.

The difficulty of telling which side is which when using bromide paper is easily overcome by just touching one corner of the paper with the tongue or lips, the film side is at once detected by its greasy touch. An even easier way is to just bite one corner, when the film side will stick to the teeth, or, by slightly damping the first finger and thumb and pinching one corner, the film side will adhere to the finger. The film side of lantern or dry plates can also be easily detected, even in the dark, by applying the tip of the tongue or lips to each side of one corner, the film side is unmistakable.

Pencil or crayon work can be fixed on bromide prints, and made to assume the texture of the gelatine surface by a jet of steam, such as can be obtained through a piece of rubber tubing fixed to the spout of a kettle being carefully directed against the surface. The upper surface of gelatine is softened a little under the action of the steam, and the powders are amalgamated with it. It is necessary, however, to watch the operation very carefully, and not allow the action of the steam to be too great, or the gelatine may melt and run.

Always, before going out with the camera, stick a little strip of stamp edging over the pull-out end of the dark slide. When pulling out the shutter, the paper is broken, and it is then easy to see which plate has been exposed, and the risk of double exposure is done away with. When on tour, plates that have been exposed and taken from the slides should not be packed with pieces of printed paper between them, or the ink will affect the plates, and the result on development will be a replica of printed matter, which does not tend to improve the negative. Either use clean pure paper for this purpose, or, better still, use nothing, and pack the plates, after carefully dusting them, face to face, then wrap them in the brown paper from which they were originally taken, and replace them in the original box. The box should be marked with the numbers, or each plate, when being packed, should have a piece of stamp paper stuck on the back bearing a number to correspond with the entries in the exposure book, which every well-regulated photographer, *of course*, always carries. If, however, plates have been damaged by the film having come in contact with printed paper, they should be washed for some time in a from two to four per cent. solution of glacial acetic acid, then well washed, immersed in alcohol, and developed in a vigorous developer.

When using hydroquinone developer with caustic soda as an accelerator, never forget to shake the bottle. Caustic soda is heavier than water, and in solution lies at the bottom of the bottle; so, with a full bottle, the ounce or so poured out is little more than pure water, and then the plate-maker gets blamed. In all toning baths containing sulphocyanides always add the gold to the bath, and not *vice versâ*, or else the gold will be precipitated.

The shifting of the paper during printing, especially when using small pieces, often causes trouble. This can be remedied by removing the wire which secures the spring on the back of the frame, and one of the holes, preferably that nearest the hinges, is bored through to the face of the frame, and a wire nail of sufficient length is then inserted from the front and bent over at right angles on the back until parallel with the surface of the wood. The pressure can be put on by forcing the springs down on the back and turning the nail until it lies across the

spring, the head on the other side, of course, preventing it being drawn through. Thus it will be seen that sliding the spring along the back which was the cause of the paper moving, is done away with.

Dirty bottles are often a bugbear in the dark room, especially when wanted in a hurry for fresh solutions and they refuse to get clean. The following may help: Greasy bottles should be washed with benzine or with a solution of permanganate of potash, to which has been added some hydrochloric acid. The disengaged chlorine in the latter destroys the fatty matter, which then disappears by washing in water. Bottles that have contained resinous substances should be washed with potash or soda, and rinsed with alcohol. Bottles that have contained essences wash with sulphuric acid and with water. In all cases, when cleaning dirty bottles, the addition of some fine shot, which should be vigorously shaken about in the bottle, considerably helps to remove the foreign matter.

Broken ebonite dishes, or cracked or chipped dishes, can be expeditiously mended and made sound by the judicious use of a little of Prout's elastic glue, which is cheap, waterproof, and easily applied, but is fearful stuff to get on one's fingers.

A good thing to remember, if it is required to weigh out chemicals and the weights are lost, is that three pennies weigh approximately an ounce avoirdupois, and so also do any number of silver coins making together in value five shillings, *i.e.*, two half-crowns, or four shillings and two sixpennies, and, of course, silver coins representing two-and-sixpence weigh half an ounce. A halfpenny and a threepenny piece weigh a quarter of an ounce avoirdupois.

And lastly, notwithstanding anything stated to the contrary, never use freshly mixed hypo. Nothing is so productive of frilling. Use it clean and fresh by all means, but not freshly mixed, as freshly mixed hypo is always considerably lower in temperature than the surrounding air or the developer, and, by taking a negative from a developer slightly warmed possibly by contact with the fingers, and, after washing, plunging it into a solution many degrees lower in temperature, frilling is almost bound to ensue, and the poor plate-maker has some more correspondence to answer.

BORROWED CHILDREN.

By James Reuel Smith.

Children lend themselves, as the French say, and that literally to the enlivening of outdoor pictures, to an extent that is not fully appreciated or availed of by the generality of photographers.

This may be accounted for partly by the usual shyness of the stranger child. Make any effort to induce one to appear in a picture, and it is likely that there will at once spring up such an antipathy to so doing that wild horses could hardly drag the small personage into the view. But diplomatically imbue the young one with the idea that his or her presence must not be manifest in the picture, and a spirit of opposition or of mischief will make it almost impossible to focus the scene without finding the supposed objectionable presence stealing across the edge of the ground glass, and then the matter is easily arranged.

In making a collection of pictures of springs, which involved a very pleasant journey of some 200 miles, and illustrated two score of sylvan nooks, it was a matter of surprise to find how ubiquitous the human youngster is, and nearly every photograph contains an unknown child of less than ten years, assuming in nearly every case a self-suggested pose about the spring, which adds more to the attractiveness of the print than would be imagined without comparison with the few sketches in which a little figure is wanting.

Girls, as a rule, are borrowed to better advantage than boys; they are more amenable to the subtle influence of candies, and they enter into the spirit of the composition more readily and soberly. They generally aim to make the affair a success, while with boys it is not unlikely to be discovered, when the lens is uncapped, that they have assumed some ludicrous attitude and spoiled the plate.

The rates for these loans are usually far from usurious, though at the end of an exposure I was once confronted with a doting father who boldly demanded something like 16*s*. for the use of his valuable offspring! Fortunately the argument attracted the mother, who was willing to compromise the matter for one of the photographs.

MUSIC IN THE SERVICE OF PHOTOGRAPHY.

By H. O. Klein.

The space at my disposal hardly permits me to enter at greater length into the old acknowledged truth, that music has enormous influence on the human mind, and consequently changes the features of a person almost momentarily. What a world of different expressions are we able to call with familiar melodies, and how valuable the fact that emotions express themselves upon the mirror of our soul!

Now, while all this is universally acknowledged, it seemed to me so singular that so little use has been made of this invaluable phenomenon in photography?

The painter or sculptor has plenty of opportunity to study the individuality of his model, and to compose many a seen expression to a harmonious chord, giving life and soul, real artistic value to his work.

The photographer is far from having this advantage; he is bound to show in his portraits one expression, single and in most cases not individual. For a great many years experiments have been frequently made with the idea of finding the way to produce—force—that natural pleasant, and last, but not least, characteristic expression, a faithful representation of the character of a person, and surely not without result.

But there is still a vast number of persons to be found who did not obtain a satisfactory likeness, persons with highly developed sense for their characteristic beauties.

Their likeness was a truthful imitation of form, without that most necessary and essential item—life.

It is difficult to express in words what an artists feels, and which force enables him to enliven his portrait. I had opportunity to meet a lady, who told me that, in spite of her innumerable visits to the leading

photographers in this world, she could not obtain a good portrait, on account of her 'unnatural expression.' Unnatural expression, forced with the well-known entertainments in photographic studios, in connexion with the screwing of the 'head rest,' a ceremony which people dread like the torture of the middle ages.

The excuse for incompetency was the final decision, accompanied with a mysterious smile, that 'the lady had no features.'

And now I should like to draw attention to the following experiment: The same lady had been photographed by a clever man, who made use of a well-known melody during the exposure, and, to his great surprise, received a likeness full of life and character. The very soul of the model seemed to be expressed, and made the photograph a little work of art. This one case made the beginning of a great number of similar experiments, with the same satisfactory results.

I hope I have not touched a controversial matter in relating this extremely instructing and interesting event; and who knows, some day the photographer may be considered worthy to be called 'artist?' but I am convinced that that eventful day will not come until he learns to study his business with the same devotion and intelligence with which men of art study theirs, making use of everything requisite to give artistic value to his work.

PHOTOGRAPHING FEELINGS.

By J. Rees.

We are altogether too commonplace in our work, do not realise the possibilities open to us, and are too readily disposed to regard the advances made in mechanical, optical, and chemical directions as satisfactory, to the exclusion of much that is higher.

Nothing there is to be said against this bettering of the more material side of things—everything for it, indeed, as far as it goes, for there is no good sense, for instance, in carrying extra weight in a camera and its accessories if lighter ones will do as well; the better the lens, again, the better should be the picture; and extra rapidity in a plate may mean the essential factor that makes possible certain kinds of work. But there must be something above this, or we soon tire of it; the labour is too merely mechanical. One person can take a view as well as another if placed, with good gear, in the right spot, the general result being, that the great majority of photographs are much of a type, very few rising above a level of fair mediocrity. The pleasure of doing something distinctive, and, as such, flattering to pride or vanity, is thus knocked away as a stimulus, interest is lost, and a delightful occupation and pastime oftentimes given up, after the initial novelty has passed away, more from not knowing of its undeveloped possibilities than any hard-and-fast objection.

If this be true, the logical converse must also be, that, given distinctive interest in the work, pleasure would remain and increase.

The length and breadth of the purely practical and manipulative field being equally open to all, and requiring, mainly, but application and fair common capacity for its mastery, anything beyond technical finish and excellence must evidently be a something the worker can succeed in intro-

ducing as particularly belonging to himself, something of his own individuality in short. This is borne out, I think, if we look at the case of the artist. Who ever heard of a painter losing interest in his picture if his soul were in it? Ay, 'there's the distinctive rub,' *his soul* is in it; and, if the photographer is to taste of the same high pleasure, he must also have something of the same high aim, must introduce to as great a measure as possible his soul into his work, in the form of a clear expressing of a special idea or feeling. He is handicapped as compared with his fellow-worker in the having to pass his soul, or feeling, for more or less mechanical moulding, through a box, but that cannot be helped; and the moulding need not be the result of so hard a squeezing as to altogether spoil its shape.

How is it to be set about?

The first essential, of course, is the having a feeling to portray; equally so, that it be a one definite enough to stand handling, and pleasant enough to bring about the strong desire to picture it. Surely none of us can be lacking in such, nor in the accompanying regret, that if very pleasant they are so very fleeting. A man taking his early walks in the spring time, say, is very much, and very pleasurably, impressed by the sweet freshness of everything, the clear sunlight, bursting of buds, singing of birds, and all that goes to make up this most delightful of seasons. He feels nearer the hidden spirit of things than he generally does, and fervently wishes he could always remain so. He cannot, he knows; but, failing ever-present spring, why not deliberately analyse out the causes that go to make up his happiness, and by photographing a selected one, or two, or more, form a picture that would at any time, with the willing aid of the imagination, serve to bring up before him, and keep alive, the happy thoughts and feelings he so desires to preserve? A turn of the narrow lane, with an included foreground corner of budding hedge, a rough gate, flanked by a hawthorn beginning to bloom, lambs, and primrose banks; one or several of these, or others, carefully selected, composition as carefully arranged, best time and length of exposure arrived at after all-round looking at things, and due calculation —and all as subservient as they possibly can be made to the one central, dominant idea of representing spring. Or, possibly an older man, with the springtime of life behind him, he may find more congenial thought and deeper pleasure in the fruiting and the russet tints of autumn. Let him endeavour by including a characteristic touch in his picture to also photograph his particular feeling. The vague distances of the sea, sandy dunes, or breezy breadth of moorland, hold some chained and charmed; others respond most readily to the quaint disorder of a straggling fishing village, the mediæval air of the gabled houses in the cobbled streets of an old-world country town, the cloistered quiet of cathedral precincts, or the drowsy hum of an old mill wheel on a summer's afternoon; whilst yet others, enjoying and appreciating these very much, care best for expression of face or grace of form. There is no reason why charms and feelings begotten by all such should not to a great degree find expression in a picture.

"All very well in theory, reads pleasantly, but not practicable."

Oh, yes, it is; but not by the man who takes a dozen plates out at a time, and conscientiously exposes them; the rather by the one who is content to take out one plate, and bring it back again a dozen times unex-

posed, if the conditions be not favourable—or, better perhaps, one content to go on exposing, and smashing up failures, until he gets what he wants.

Imagine the satisfaction when such a negative is finally unfolding its so-sought-after beauties in the developing dish! How differently regarded to the work hitherto turned out, with its marring feature of indiscriminateness! or, as an enlargement, how differently regarded to the pictures at present upon our walls! A good deal of condensed wisdom and human nature there is in the old saying, 'Nothing pay, nothing value.' Hitherto it is too little that we have paid for our photographs; if we elect to pay more, we will value more the result, for it will soon be felt to be worth valuing.

Occasionally, such work has been turned out, but from its very nature, in requiring so much thought and trouble, it cannot be, nor ever become, common. The type of man, too, who goes in for it is not a common one—more perhaps than the one who can appreciate it—and consequently not a one to push himself and his work into the most public place. I am not referring to the conventional impressionist and his results; for, whilst giving him every credit for high aim, his methods must be wrong when they result in the muddy or misty out-of-focus productions generally shown us. There is no reason either why breadth of suggestion is only to be photographically given by grey subdued tones of subject in a low light. Very good work has been done in this way, but it is decidedly apt to make us feel a bit miserable; there is quite enough grey in actual life, without having its faithful presentation ever hanging before us; and, although, when a bit bilious, we are more in sympathy with the dull greys than the transparent whites and clear ambers, the bilious condition is, after all, the exceptional one; and with, in the main, a faithfully working liver, we would the better enjoy as a regular thing the more cheerful side of things. I fail to see that with a clear aim and careful selection—these as far and away the chief factors—watching for favourable lighting, and probably the use of a long-focus lens, a large aperture, and quick exposure, it would not be practicable to get the agreeable suggestion of warmth and sparkle of sunlight into a picture, to a high and satisfactory end.

It requires a great deal of thinking and arranging for proper accomplishment, and it is useless to think of consulting a text-book for instruction; but, from these very facts, I venture to think that it will appeal the more readily to the brainier photographer, gifted with a saving touch of sentiment and imagination, and who feels he has feelings worth the portrayal.

THE HAND CAMERA ONCE MORE.

By H. P. Robinson.

Last year I thought I had said all about the hand camera that I should ever have to say, but a state of finality is a state of bliss we shall never attain. This year I am in a position to paraphrase Sidney Smith's saying about being preached to death by wild curates; it has been my fortune to be almost photographed to death by wild amateurs. This horrible fate has given me an opportunity of examining several new

cameras, and, if we may argue from the particular to the general, I should conclude that the quality of the technical manufacture of cameras is falling off by leaps and bounds. It is, however, gratifying to know that nearly all the defective cameras I have examined are foreign made. I don't mean to enter fully into all the defects I have found, but will mention a very common one.

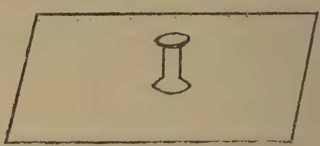
I have seen at least a dozen (imagine the torture of sitting for all these!) portraits of myself this year, taken by aid of different cameras, chiefly foreign, and the image of the unfortunate victim was not in the right position in the space. There was too much space in front of the figure, or behind, or on top, or below; or the head failed in its struggle to get all of it on the plate, like some of the very newest, most foreign-looking, and most approved portraits in the Salon this year. This gives me an idea that has not struck me before. The cause of this particular and much-admired eccentricity in foreign portraits is caused by this defect in foreign cameras.

To resume. I investigated this defect, so much appreciated by those who affect to worship the unusual, and found it to lie in the finders. In every instance these finders failed to register an image that could be relied on. It struck me that these were precisely the instruments to put into the hands of young amateurs who were ambitious of producing the best French portraiture in the most automatical manner; but, if they are wanted for serious use, one would almost think it would be worth the while of manufacturers to examine these instruments of precision before they are issued to confiding beginners.

MOUNTING P.O.P. AND OTHER PRINTS.

By W. E. Leek.

To mount prints cleanly, expeditiously, and without injuring the gloss of highly glazed papers, such as P.O.P., have one or more (according to the sizes required) sheets of tin or zinc, cut about three-sixteenths of an inch smaller all round than the print (trimmed to size) to be mounted. A convenient handle, fixed to the sheets of tin with a couple of fine screws or small wire nails, may be utilised from empty cotton reels.



To mount, all that is necessary is to place the sheet of tin on back of print, and paste the narrow margin of uncovered portion of print, using for the purpose either a stiff brush or one's finger; raise print with point of fine penknife, place in position on mount, and lightly press down with roller squeegee.

The advantages of this system of mounting are: the prints are less likely to fade, do not cockle, require less mountant, and economise time.

I append a rough sketch of the apparatus.

COMBINATIONS AMONG PHOTOGRAPHIC ASSISTANTS.

By Arthur Field.

I.—Trade Unionism.

Just in the same way as Mr. J. A. Randall, in The British Journal of Photography (April 17th, 1895), acknowledged my pioneer work in the cause of photographic organization, so I desire to repeat what I said in your last Almanac in acknowledgement of the work of Mr. Randall. It was by a mental evolution that Mr. Randall arrived at supporting my idea of a trade union for photographic workers; back in 1895 he had no desire to go to the 'extremity of forming a union.' The logic of events had caused him to embrace the full Union idea by 1896, and his suggestion that we should join the 'National Union of Shop Assistants, Warehousemen, and Clerks' was decidedly 'bettering the instruction.' I, with my idea of a photographic society, 'failed' (if there can be such a thing as absolute failure in such agitations); I equally failed when I tried to get a cognate craft to admit photographic assistants into its Society. Mr. J. A. Randall, in a happy moment, looked beyond the initial difficulties of our combination with the membership of a shop assistants' organization—very pluckily set aside the inevitable objections—with the result that photographic assistants, male and female, have now the opportunity of joining a compact and sound organization which has agreed to accept them as members.

Before I draw the attention of assistants to the advantages of the Union, I wish to say a few more nice things about myself. 'The Amalgamated Society of Lithographic Artists, Designers, Writers, Copperplate and Wood Engravers' was the society which I tried to switch my abortive photographic union on to. As I described in the last Almanac, this Society could not undertake, then, the apparently difficult task of discriminating between worthy and unqualified photographic applicants for membership. Yet, in this year of grace 1897, the 'London cousin' of the above organization (to wit, 'The National Society of Lithographic Artists') has 'Process Engravers' at the end of its title, and I learn with pleasure that process men, who were to be part of our photographic union are being admitted into the 'National Society' in large numbers. [I understand that the same development has been effected in the 'Amalgamated Society,' but I have never had the time to verify this.] I think I can pat myself on the back over this. A delegate from the London Society was present at the delegate meeting of the Amalgamated, where I advanced the plea for union, and the developments of to-day prove that we should never despair of seed sown springing up in good season.

Now to the 'National Union of Shop Assistants.' Its objects are (compare our old objects, 1890–91, pp. 758–60 of the 1896 Almanac), among others, to support legislation affecting hours of labour (weekly, half-holiday, and early closing); secure by union effort the reduction of excessive labour; abolition of unjust fines; securing of proper mealtimes, fair wages, proper sanitation, better apprenticeship system, &c.; in a word, 'to regulate the relations between employers and employed;' establish a register of situations vacant and wanted; give legal aid to members when necessity arises in their relations with their employers;

make a weekly allowance to affiliated and junior members if they are called upon to give up their employment through any trade dispute.

The Society also arranges for a *general* benefit section. In this section an unemployed benefit is paid to all full members who are out of employment through no fault of their own, or through obeying the lawful demands of the Union. Sick benefit is also paid in this section, and a funeral grant allowed to the nominees of members. Any member who joins as an assistant, and afterwards becomes an employer, retains his right to subscribe and receive such benefits as are provided by the Union, but has no voice in the management.

The following is the scale of payments *per four weeks*, and the benefits receivable per week :—

CONTRIBUTION AND BENEFIT TABLES.—MEN (Entrance 1s.).

Age on Entry.	Contribution per 4 weeks.	BENEFIT WHEN OUT OF EMPLOYMENT OR DURING SICKNESS.				PAYMENT AT DEATH TO MEMBERS OF		
		First 4 weeks, per week.	Following 4 weeks, per week.	Next 4 weeks, per week.	Following 12 weeks (per week) in sickness only.	2 years and less than 5 years.	5 years and less than 10 years.	10 years and upwards
	s. d.	£ s. 6.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
18 and under 30	2 0 3 0	0 15 0 1 2 6	0 10 0 0 15 0	0 7 6 0 12 6	0 5 0 0 7 6	4 0 0	6 0 0	10 0 0
30 and under 40	2 3 3 6	0 15 0 1 2 6	0 10 0 0 15 0	0 7 6 0 12 6	0 5 0 0 7 6			
40 and under 50	2 8 4 0	0 15 0 1 2 6	0 10 0 0 15 0	0 7 6 0 12 6	0 5 0 0 7 6			

WOMEN (Entrance 1s.).

18 and under 50	1 2 2 0	0 10 0 0 15 0	0 7 6 0 12 6	0 5 0 0 8 0	0 3 0 0 4 6	3 0 0	4 10 0	6 10 0

Half-benefit only will be allowed to members of six months' standing, and full benefit to members of twelve months' standing and upwards. The period of membership shall date from the first day of the month for which the first four weeks contribution has been paid. All contributions payable in advance.

The payment exacted from affiliated (or trade) members of either sex is 2*d.* per week; young people, under eighteen, 1*d.* per week. The entrance-fee in this section is 6*d.* and 3*d.* respectively.

That the arrangement for paying benefits are not empty promises can be proved from the following facts:—

1. The Union is always making more stringent regulations about members who have fallen into arrears, with a view to weeding out the useless.

2. It has sought to strengthen the society by increasing the contributions and reducing the benefits, rather than by playing down to the more acceptable, but less safe, alternative.

3. After all the processes of selection have been gone through, the Society numbers over 2000 financial members.

The moneys and the claims of all members are safe, no matter how far they may have to travel. They are either transferred to another branch or can pay to their original one, or in the event of either being impracticable their subscriptions are receivable by the central office. The moneys for benefit purposes are centralised and paid out from the centre. One-sixth of each full member's and one-half of each affiliated member's contributions are, however, retained by their own branch for branch expenses, as are also the entrance fees (1*s*. from full members, 6*d*. from trade members).

We have started a little branch in Maidstone, which is going along very nicely, although we find some difficulty in getting the ordinary shop assistant to even understand (let alone adopt) organization as a means of bettering his condition. If any photographic assistants, male or female, wish to join, and are not near any branch, I should be glad to give them advice and literature, and to enrol them as members of the Maidstone branch, if possible.

The time is not yet for this union to have been so affected by an incursion of photo workers as to become a 'Shop Assistants' and Photo Assistants' Union.' That is, however, only a question of time. If sufficient numbers join our own branch, say, in time for the annual delegate meeting we can put a resolution on the agenda to expand the name of the Society, and even to make provision for exclusively photographic branches if necessary. Already some of the most honoured names in the Union are those of photographers. The chief necessity is that photographic workers of all grades and both sexes shall form branches or join existing ones. In any work of the kind they will have the ready assistance of the General Secretary of the Union, or of myself. The addresses are: 'Mr. James Macpherson, N.U.S.A., 65 & 66, Chancery Lane, London, W.C.,' and 'Arthur Field, Maidstone.'

Those who know the misery of unemployment without any reserve to fall back on, those who have to pocket insults and submit to injustice simply because isolated and dependent, have now the opportunity of securing a reasonable freedom from these evils. Will they avail themselves of it? It will be theirs in measure as they strengthen the substantial organization which is open to them.

II.—Co-operation.*

The specialist in this line, my sister, Eleanor Field, is unable to do much writing just now, so I, who am subject to the scribbling habit,

* Readers should first peruse pages 669, 671–74 of the 1894 Almanac; also 686–7 o the 1895 issue.

have to take the job on. I have suffered an equal loss with her in the death of our dear sister, Catherine L. Dymock, but to Miss Field the shock has been almost the cause of her own death. Mrs. Dymock was carried off by heat-apoplexy during the phenomenal summer heat of July, 1897, in the very prime of her physical and intellectual powers. In addition to the ties of blood thus rudely broken, she was a devoted supporter of the co-operative enterprise which Miss Field started and explained in the 1894 ALMANAC. Even back in the days when I failed to see the practicability of this co-operative movement, Mrs. Dymock was ever ready with sympathy and money for this and every other effort to benefit the working folk. Since I decided to try it for what it was worth I found her suggestions, her appreciation, and her support always sympathetic, always ardent. Still full of noble schemes to help others, she was suddenly struck down. The very week of her death she had had the joy of learning that a vilified and misunderstood pauper girl, whom she had placed into a situation with a sympathetic friend, had turned out all that could be desired. The sudden demise of such a one leaves an impression on the mind as of some mythological figure reaching up to a daring divine action and stricken into stone. Thus she stands in our memory, imperishable.

If I write more in this strain there will be too little about the Co-operative Society and too much about one individual. It can be excused, however, as the one great event for our struggling little enterprise during the past year. The withdrawal of such a liberal capitalist could not but have a retarding, almost crippling, effect on a mushroom business. Our other misfortune this year has been our inability to get satisfactory terms for renewing a three years' agreement on our Maidstone branch premises. For three years the Photographic Co-operative Society had been engaged in building up a sound portrait business at this branch, the heavy rent (inclusive, over 70*l*. per annum) being the only unpleasant feature. At the end of the three years our only terms of continued tenancy were to pay a bonus, raising the rent to the equivalent of 80*l*. per annum (inclusive), with no security for renewal at the termination of another three years. The Society decided to voluntarily cut the Gordian knot at this early stage, instead of perhaps compulsorily three years later. The result is that we are now looking for premises at a sane rental, exclusively for the portrait work. Our process department has fine premises at 3, Albion-place, Maidstone.

At Sheerness-on-Sea our branch continues in working order, for the conditions there are different. Housed in one of the largest business premises in the county—94, High-street—under the wing of a friendly distributive co-operative society, we are establishing ourselves in all branches of the trade. We have a finishing department at 18, Invecta-road. Requests to establish branches at Rochester and in London are now being considered by the Committee.

At Maidstone we are gaining an increasing connexion with photo-process work, collotype, and copying. It was a decidedly wise step taken when we entered on the block business, and, as to the copying of old photographs, one would never guess there were so many in existence till he had to receive and dispatch the work. In addition to this work, we have been appointed official photographers to the Co-operative Union. This is an organization embracing 900 societies, with a million of mem-

bers. Our photographs of their annual Congresses show from 800 to 1000 faces. A similar appointment has been conferred on us by the Co-operative Wholesale Society in respect of its Exhibitions of produce and merchandise held in the London and Kent districts. Descending to smaller matters, the Independent Labour Party, the Social Democratic Federation, and other advanced labour organizations have appointed us their official Conference photographers.

Still, hard experience has demonstrated the fact that it takes a lot of custom to build up a big business. Engraving included, our present output capacity is only 1000*l*. per annum. I may here say that if we had more trade we could not do it effectively without more capital. Many things that Miss Field estimated in 1893 and 1894 (see pp. 671–674 of the 1894 ALMANAC) have turned out differently in practice. Instead of 200*l*. capital, from 800*l*. to 1000*l*. can easily be utilised by an establishment employing eight to ten people. We now require more capital, as a much larger photo-mechanical business could be built up if we advertised, and had more and better plant. To attract capital and custom, we had to completely alter the division of profits, as given on the page 673 referred to above. The following is the present arrangement:—

After paying interest on share capital at the rate of not more than four per cent. per annum, and providing for reduction of fixed stock, buildings, preliminary expenses, and other first charges, the remaining profit are divided as follows:—

(*a*) Reserve Fund, until it reaches a sum equal to a quarter of the paid-up share capital of the Society, after which it may continue to accrue to the Reserve Fund, subject to the decisions of the general meetings of the Society, which may otherwise direct it to be divided between the Educational and Provident Funds, in such proportions as the meetings shall determine	10 per cent.
(*b*) Educational Fund	7 ,, ,,
(*c*) Provident Fund	15 ,, ,,
(*d*) Committee of Management	3 ,, ,,
(*e*) Workers (pro rata on wages paid during the period to which the division relates)	35 ,, ,,
(*f*) Customers (pro rata on trade during the period to which the division relates, and paid for within a time the Committee shall determine for all customers)	30 ,, ,,

The profit accruing to every worker or customer is credited to his share account until he holds twenty 1*l*. shares in the Society; after that he receives it as he thinks fit. No customer shares in the distribution of profit under head (*f*) other than that due on purchases made, or work done, during the period to which the distribution of profit relates; nor if, during that period, the total purchases (or payments for work done) amount to less than one complete pound.

* * * *

The expense of entering accounts of, and corresponding with, holders of small parcels of capital, compels the committee to announce that only

those applications which ask for 10*l.* and upwards to be allotted, stand a chance of allotment.

This enterprise is, for all its struggles, a success. It has, in its own words, 'come to stay.' It has had to face more than competition (which it does not fear); it had to bear slander which would not consent to come out into the open, nor take on a tangible punishable form. Lying rumours went about, circulated in the first instance by people who thought the co-operative enterprise was to their detriment, to the effect that this was no co-operative society, but a business belonging to the writer of the present article, who was supposed to be under some embargo not to open a shop on his own account.

This farrago of folly and fiction was greedily carried along (for lies and typhoid germinate with equal rapidity in Maidstone) by political enemies of mine, not one of whom would have scrupled to do the underhand work he pretended to pillory. Among the more honest idiots, who believed the rumour, not one apparently tried to ascertain why a man should intrigue to create a business for thirty shareholders to own and get the benefits of! However, by the offer of a reward for information that should give us the author of the libel at first-hand, we got the infection under. The publication of the following official refutation, by the representative co-operative organizations of the country and district, gave the finishing stroke to the scandal:—

'Owing to false and misleading statements having been circulated in Maidstone as to the *bonâ fides* of the Photographic Co-operative Society, Limited., the undersigned certify that the above Society (of which Miss E. F. Field is Secretary), is a *bonâ fide* co-operative establishment. It is registered according to Act of Parliament, and a member of the Co-operative Union, also federated with the various national co-operative organizations. Consequently the business does not belong to an individual, but to the shareholders collectively." Signed, J. C. Gray, Secretary Co-operative Union, Limited; Mark H. Clear, Secretary Sheerness Co-operative Discount Association; William Broomhall, Secretary National Co-operative Festival Society; W. J. Lewington, President Photographic Co-operation, and Secretary of Barge-builders' Co-operative Society."

'Certificate of Registration.—"Register No. 3201 R. The Photographic Co-operative Society, Limited, is registered under the Industrial and Provident Societies Act, 1876, this 17th day of November, 1893. Copy kept, E. M. B. [Sealed] Registry of Friendly Societies Central Office."'

Here followed a list of thirty-three members, with their addresses.

* * * *

We are now desirous of spreading this movement for the co-operative self-employment of photographic assistants, not merely by improving our own co-operative shop with its two branches, but by giving advice, assistance, and literature to all who want to start a co-operative studio or workshop for themselves.

THE LEADING ANTISEPTIC IN PHOTOGRAPHIC OPERATIONS.

By Thomas Bolas, F.C.S., F.I.C.

Incipient putrefaction has perhaps more to do with the fading of silver prints than all other causes put together; of course, in saying this I am merely giving my own impression, which is a kind of roughly arrived-at resultant of numerous observations, and is not the outcome of the perhaps more trustworthy methods of statistical or other similar determination. Perhaps I ought not in strictness to use the term 'incipient' putrefaction, but rather the putrefaction of a small quantity of the whole mass present. This happens especially when silver prints, whether printed out or made by development, are enclosed in a mass of paper, and the whole is maintained for months or years in a slightly damp condition. It may be the prints are mounted on cardboard and piled together or they may be in an album, or may be bound as inset illustrations—a common enough practice nowadays. All papers of such kinds as are commonly used in printing, mount-making, and album construction, not only contain the less alterable vegetable fibre or cellulose, but also a certain amount of easily putrescent sizing material and sulphate of lime. When the book or other mass of paper is stored in a damp place, the sulphate of lime becomes reduced to sulphide of calcium as a secondary result of the putrefaction, and reaction between the sulphide of calcium and carbonic acid (another product of putrefaction) results in the liberation of traces of sulphuretted hydrogen, which itself is fatal to silver prints of all kinds if acting for long upon the damp prints. Any silver print bound up in an ordinary book (that is, a book printed on any paper but such chemically pure paper as only comes in on the fringe of the paper trade) and kept in a damp place for five or six years will, I believe, fade. This conclusion I have come to not only by noting the fading of prints placed in books already in that stage of putrefaction at which traces of sulphuretted hydrogen are evolved, but also by noting the difference of behaviour between copies of the same editions of books having silver-print illustrations, the illustrations being intact in the case of copies kept dry in the ordinary sense of the term, and faded in those which were in the sulphuretted-hydrogen stage of putrescence—a condition by no means unusual in libraries or dwelling-houses.

This brings me to my point, that for almost all, or perhaps all, photographic preparations liable to putrefactive change the best antiseptic of all is dryness. Dryness in the ordinary sense is good and desirable, but artificial dryness, such as one obtains in a well-managed chloride-of-calcium box, is better, and, when sensitive plates or paper have to be preserved for a long time under trying conditions of temperature, the chloride-of-calcium box should be used.

Just one general instance of the effect of dryness. Few objects disappear so rapidly as an animal and its skin in a hot and damp climate; but that same skin, dried and converted into parchment or vellum, is one of the most lasting materials if only kept dry, some samples of vellum about 2000 years old being as sound and good as when new. As a photographic equivalent, let me mention the case of a moist gelatino-bromide emulsion and a similar emulsion dried to a pellicle and kept in this condition, as Mr. Kennett proposed and practised,

SOME NOTES ON THE HALF-TONE PROCESS.

By William Gamble.

In my experience I find that every other process worker one meets has 'got a new process,' yet I think it may safely be said that in the past ten years there has not been one photo-mechanical process patented, published, or brought into use that is distinctly original. The germs of all present-day processes will be found in records dating back ten years or more, and, although vast strides have been made in photo-mechanical processes, it is really a fact that very little that is new has been invented. A great many valuable processes had lain dormant for a number of years because the time was not ripe, but nowadays, when every one interested can see the value of these old ideas, they are being constantly unearthed from back numbers of photographic journals and year-books. In the hands of practical men some of these old processes have been made very useful by adaptation to present needs. But to the beginner in process work they too often prove great pitfalls, leading to waste of time and money. For instance, think of the number of people who have run away with the idea that an irregular grain would be much better than a mechanical grain for half-tone blocks, when they ought to have seen that the very success of the ruled screen proves that it has accomplished what scores of the most able experimenters tried to attain before the present method came into vogue. The half-tone process of to-day is an exemplification of the law of the survival of the fittest. It is at its best a compromise, but we can say it is the best possible compromise in the matter of converting a photograph into a typographic block. I am not one to advocate that we should rest content with our present methods, but I do most earnestly counsel young process workers to avoid wasting their time on obsolete processes before they have fully learnt those which are practised to-day.

Then again, I would like to give a word of advice as to trying to dispense with appliances which are universally conceded to be the right things for the work in hand. It is not difficult nowadays to find out what is generally used in the trade in the matter of screens, cameras, lenses, and other appliances; and it would save the beginner much in temper and in pocket if he would be content to follow the lead instead of going his own obstinate way, or allow himself to be persuaded out of the beaten track. There is no article so indispensable for the working of the half-tone process as a good screen. Several have been put on the market from time to time which have only proved traps for the unwary novice to part with his money. There is only one screen that is accepted as orthodox, that of Max Levy, and let the half-tone worker who would be successful be sure he gets it.

Further, I would counsel process workers in buying screens to avoid any faddist notions about the ruling. The usual thing is to have a black line the same width, or a trifle narrower than the transparent space between. Either excessively thin or thick lines are a mistake. Better leave it to the maker to supply what has been found most useful and learn to use that which he supplies. The character of the line may necessitate some slight difference of working, if the operator has been accustomed to either a thicker or a thinner line. This variation of method will consist in one of two things, either a difference in the

normal distance of the screen or an alteration of the stop. Some operators think that a thick-line screen merely necessitates a longer exposure, but it will be found, so far as concerns the half-tone process, that a longer or shorter exposure does not amount to the same thing as varying the size of the stop.

This brings me to the much-debated question of screen distances, and it may be safely said that in the year just ending all the leading operators have been brought into agreement on this point, and it is now admitted that a variation of the screen distance is a necessity for securing the best results, but I am afraid that a good many do not yet grasp the principle on which this matter of distancing the screen is based. The general principle, cleared away from theories of such action as diffraction and penumbra, which only concern the advanced worker, can be readily proved by some very simple mathematics, but, unfortunately, so few care to try grasping it in this way. Perhaps I can make it more plain by the following method of ocular demonstration.

Cut out of stiff cardboard a triangular strip having a base width of about 1in., and long enough to form a fine tapering point. Also cut out the pattern of a few screen openings. Insert the cardboard wedge through the aperture of one of the diaphragms usually employed until the wedge fits the opening. Also insert the point of the wedge through one of the pattern screen openings, as far as it will go. The result will be as this illustration:—

Now if we suppose that the wedge of cardboard is a pencil of light coming through the diaphragm and passing through the screen opening, we conceive a very good idea of the action of the screen. The tapering end which projects behind the screen is the proportionate screen distance for the size of diaphragm employed, and if we place a surface (to represent the sensitive plate) in contact with the point of the wedge, we are placing the plate at the best possible distance from the screen. Obviously, if we make the screen opening larger, this distance will be longer, because the wedge will go further through. This very well illustrates the proportion which exists between the size of the diaphragm, the size of the screen opening, the extension of the camera, and the screen distance. It shows that, if we enlarge or decrease the extension of the camera, we must enlarge or decrease the stop correspondingly, for the wedge must always be a fit in the screen and diaphragm openings. It will be found in practice that we cannot so exactly adjust the conditions that the screen distance may remain constant, and, at any rate, it can only be constant for one particular screen; therefore, I counsel the necessity of a screen adjustment gear either in the back of the camera or in the dark slide.

BACKGROUNDS.

By Edmond Wallis.

It often happens that a photographer, especially in a provincial town, has occasion to require the use of special backgrounds to suit subjects, that are a trifle out of the beaten track as regards the general run of studio work, such, for instance, as theatrical pictures, fancy-dress portraits, and also pictures that he may wish to arrange himself as show specimens. In such a case the purchasing of a background is quite out of the question, as it would have to be painted on purpose, and by the time it could be received it would be too late. On the other hand, it could be painted by the photographer himself with a few points to work with (as I take it, most have a knowledge of drawing sufficient for the purpose) in the evening. When, as is mostly the case, an appointment is made a day beforehand, it would be ready for the studio next morning.

As the details of stretching the canvas, mixing the distempers, &c., do not exactly come in the glimmering of nature, a few sentences on the same may come accceptable to a few.

A canvas known as grey calico can be procured at any drapers of a width suitable for most subjects. Ninety inches is the widest most drapers stock, but it can be obtained to order up to 9 feet. It will be found that a width of 90 inches will, however, allow enough space for most subjects, and that could be sewn together for large groups without the join showing if the seam side is not painted on.

A framework the size of the ground decided on must be made of $2\frac{1}{2} \times 1$ inch, halved together at the corners, and firmly screwed with cross pieces at the angles to keep it square, which done the canvas may be stretched, beginning at the top left-hand corner, using five-eighth clout nails, and driving them in half way about 8 inches apart. Start, if possible, with the outside or selvage edge of the material, and keep it in a perfectly straight line, not pulling the canvas too much, as it will be found to stretch very easily at the edge, and cause wrinkles lower down that will be difficult to get rid of. Having finished the top, come down the left-hand side to within a foot or so of the bottom, keeping the edge square with the frame; then the right-hand side, and, lastly, the bottom, taking it out to each side from the middle, and observing when the first nail is put in that it centres the stretching. Work out to the corners; leaving the space not tacked on each side until last allows any creases to be better got rid of than would otherwise be the case. Observance of this avoids being compelled to pull out nails again.

Being stretched satisfactorily, it should receive a coat of size, made by placing size procured at the oil shops in sufficient water to cover it, and warming until dissolved, which should be evenly applied with a suitable brush. The best to use is that known as a pound brush, but as these are rather expensive, a cheaper tool is one of an oval shape, about 2 inches or $2\frac{1}{2}$ wide. It should be allowed to dry before painting.

Now, as to mixing the distempers. Those most used and generally liked for softness of effect are mixtures of whiting and lamp-black, held on with size, although, if a warmer tone is desired, burnt umber may be used. Procure seven pounds of whiting, place in a pail, and just cover with water, allow to stand a time, when pour off the water not taken up. Next melt six pounds of size in enough water to nearly cover it, and

when dissolved, add to the whiting (reserving about a pint to mix up the lamp-black), and well stir until all the whiting is thoroughly mixed with it. For the black, three quarters of a pound of lamp-black are put into a vessel, and the size well mixed in a little at a time. If it is all added at once, owing to the lightness of the black, great difficulty will be experienced in mixing, which, if not thoroughly done, will allow particles of lamp-black to work out by the action of the brush in applying, and result in the shade drying much darker than it looked otherwise.

It is best to have about four shades. Leave a little white and black, and have the lightest shade to dry about the tone of a light India-tint mount, the darkest nearly black, and the two other shades equally intermediate. The shade should be ascertained before painting by applying a little to a piece of cardboard, and drying at the fire, as it dries a good bit lighter.

Three or four brushes will be needed of the size described, and one known as a flitch for lining. For the latter a straight edge will also be required 4 feet long, 2½ wide, 1 inch thick, and bevelled at the edges, so that the distemper as it touches it does not touch the canvas, on the principle of a ruler for pen and ink.

The painting is better described as dabbling with the brush rather than working on the up and down and across lines of the house-painter; one shade being dabbled and worked into the other before it is dry. A very free hand is necessary, especially with foliage. Effect is obtained suddenly rather than by drawing with a brush. Not too much detail should be aimed at, or breadth—the essential feature of a good background—will be out of it. All design is better suggestive than forcible; a soft effect rather than a crude mapping of lines. The principles of drawing must be correct as to perspective, and the rest will come after a short acquaintance with the brushes and the ease of handling distemper that only comes with practice.

PHOTOGRAPHY FOR THE *DILETTANTI*.

By W. Hampson.

After a season with a 12 × 10 outfit, weighing thirty-six pounds, when ready to take the field, Nature at last rebelled, and compelled me to look round and see if photography could not be conducted under pleasanter auspices.

Certainly there is a distinct charm and delight in seeing the image on the screen of a large camera altogether forbidden to the user of a small size, but this pleasure is apt to pall upon one after a time, when it entails the user converting himself into a packhorse every time the camera has to be moved.

I decided on a change. The camera must be quarter-plate in size, it must go into the pocket; this necessitated using dark slides, the slides must go into the pocket likewise. The camera must be capable of being used on a tripod if wanted, have rising front, focussing arrangement, and shutter giving different speeds. These were stringent conditions, but, after much searching in catalogues, I found them exemplified in Shew's Xit camera, which is remarkably compact and efficient.

I can now sally forth, with camera in one pocket and slides in another, for my morning, afternoon, or evening walk, feeling sure I shall be ready to attempt to photograph that pretty bit or splendid sky effect that always presents itself when the camera is left at home, and even if nothing worth exposing on is seen, the camera is no inconvenience, as it unobtrusively rests in the pocket; in fact, one almost forgets it is there until wanted.

Another advantage, I can go equipped in the company of non-photographers for a day's outing, and not be looked upon as a curious kind of animal, like the common or garden photographer, who generally takes up the cosiest corner of the vehicle with a mysterious looking bag, and tips the hat of the testy old bachelor over his eyes with the end of his tripod, or else places a black box with an evil eye glaring in the face of the old maid, who insists on changing seats, as she does not want to be photographed—oh dear no! not for the world!

Such a camera as this, handy and efficient, adds a new lease to a photographic life, and I should advise any one who is tired of carrying the stand camera, or the equally disagreeable black box magazine camera, to give the pocket one a trial. But it must be quarter-plate in size; a less than this is not so convenient, mainly from the difficulty of procuring plates in out-of-the-way districts, whereas quarter-plates are met with everywhere.

PRINTING IN CARBON.

By W. M. S.

I THINK it must be admitted that printing in carbon gives the most artistic effects of any known process, and brings the work of the photographer nearer to that of the painter's brush than any process yet discovered. Bichromate of potash is the sensitive salt used, and gelatine the medium by which it is held on the paper. Almost any colour may be obtained by adding a suitable pigment to the gelatine.

The *rationale* of the process is briefly as follows:—Bichromate of potash has the property of causing gelatine to become insoluble in hot water after exposure to light. Paper is coated with gelatine, to which some pigment has been added, and is called commercially unsensitised tissue. To sensitise, the paper is treated with bichromate of potash, and, when dry, is fit for use. The sensitised paper, or tissue, readily absorbs moisture, and must therefore be kept perfectly dry, otherwise bad prints will be the result. It also undergoes gradual change, so that the sooner it is used after sensitising the better. It will, however, keep in fairly good condition for twelve or fourteen days, but, when possible, it is desirable to use it fresh. To make a carbon print, place a piece of sensitised tissue behind a negative in the usual manner, and expose. The action of light produces no visible effect, so that some means have to be adopted in order to know when it has received sufficient exposure. I find that the simplest method is to select another negative of as near as possible the same printing density as the one off which the carbon print is to be made, and expose under this a piece of ordinary printing-out silver paper side by side with the carbon print until it is very slightly darker than the finished print should be. When that point is

reached, it may be considered that the carbon print has also received sufficient exposure. We have now to develop the print, which is done by dissolving away the unchanged gelatine and pigment with hot water. First of all the tissue has to be transferred from the temporary support, as the paper on which the gelatine and pigment is termed, to a final support, or, in other words, it has to be stripped off the paper on which it was exposed and transferred on to another piece. To accomplish this, the print is soaked for a few minutes in a dish of cold water to slightly soften the gelatine. A stout piece of transfer paper is then placed over the print while it is in a wet state, and both are laid on a piece of glass and sponged or squeegeed carefully to insure intimate contact. Dry off the superfluous moisture with blotting-paper, and it is then ready for development. Have a dish containg water, at a temperature of from 100° to 110° Fahr., in readiness, into which immerse the print with its support. In a few minutes the gelatine will be seen oozing out between the paper. When this point is reached, take hold of one corner of the paper and strip it evenly off. This, of course, requires a little care and practice; but do not be discouraged if you fail on first trial. You have now in the dish of hot water the gelatine transferred to its permanent support. Lave the hot water over it until the gelatine which has been unacted upon by light is all dissolved away. When this is done, well wash the print until the water runs off it quite clear, and place it for a few minutes in a saturated solution of alum. Well rinse again, and the print is finished.

It may be here mentioned that the picture will be reversed, *i.e.*, objects to the left on the negative will be to the right on the carbon print. Should it be considered desirable to produce a picture without this reversal, the tissue has to be tranferred a second time, and is known as the double-transfer process. It is, of course, more troublesome, and, for all ordinary subjects, unnecessary.

There are many points of detail in the process which cannot be dealt with in this short article. Any one, however, wishing to take up carbon printing will have no difficulty in obtaining full information from the makers of the tissue. I would strongly recommend amateurs to turn their attention to this kind of printing, and I can promise them they will be charmed by it.

DARK ROOM LIGHT.

By T. E. Huston (Cannelton, Ind., U.S.A.).

Many amateurs fail to make good negatives because they trust to the cheap lanterns sent out with beginners' outfits. Some of these are nothing but a cylinder of ruby paper or fabric, of more or less uncertain age. All coloured cloth or paper fades more or less, and much of the ruby cloth has small holes in it. Again, this class of lantern obscures the light so much that it is necessary to hold the negative quite closely to be able to see what you are doing. No light is safe if you use too much of it.

Get a wooden box of any kind, about eight inches square and twelve inches high, a piece of ruby glass six by eight inches, and one of green

the same size, a hand lamp, a piece of tin, and some lampblack. Cut out one of the sides of the box, and put in the glass, green on the outside. Make a sliding door on the opposite side large enough to admit the lamp. Cut a hole in the top for ventilation. Swing a piece of tin just below to shut in the direct rays. Paint the inside a dead black, and there you are. You will have plenty of light, and one that is both safe and pleasant. The green light screens the eye from the unpleasant effects of the ruby light. With this light any room will answer for a dark room at night. Have a screen to shut off the light as much as possible during the first stages of development. Accustom yourself to fill plate-holders in the dark, and you will have less trouble with smoky negatives.

A considerable experience this summer convinces me that amateurs are not the only people that sin 'against light' in this manner. I have seen professional darkrooms that were far from dark. Streaks of daylight peeped cheerfully under the door, and the great sun himself looked in through one thickness of ruby glass. How good work is done under such circumstances is beyond me.

HOW TO REMOVE SENSITIVE PAPER FROM A NEGATIVE TO WHICH IT HAS STUCK FAST.

By J. T. Hackett.

About three or four years ago I took two $8\frac{1}{2}$ by $6\frac{1}{2}$-inch gelatine negatives of a house from two different points of view, which I varnished with a spirit varnish in the usual manner; but, as the negatives were rather dense for a bad, diffused light, I printed them in the sun. But judge my surprise when I found that the sensitive paper was stuck fast to the negatives in two or three different places in patches of at least half an inch wide and about two inches long. I need hardly say that the cause of this occurrence was due to the action of a hot sun on a tacky varnish, and perhaps also slightly due to a little dampness of the sensitive paper and the pads of the printing frame. Had I known that the varnish was tacky, I should not have used it, of course, but I did not know it until it was too late. The prints had therefore to be torn off the negatives in several pieces, and, as the portions that would not come off covered important parts of the negative, I unfortunately lost a very good order, as the bad weather and other causes prevented the negatives being retaken. As I did not know at that time, a certain method of removing the pieces of sensitive paper without running a great risk of destroying a portion of the image that was under it, although I tried to do so; I therefore put the negatives away, thinking that I might think of a plan of doing it at some future time, and that they would do to try it upon. The following method I discovered by accident some months ago, and found it answer very well indeed if proper care and patience are brought to bear when employing it. *On no account must the negative be placed in water, because, although this method might easily remove the sensitive paper, it would dissolve the free silver in the paper, which the gelatine film would absorb very readily*, which, although it may not show its presence at the time, it would probably do so sooner or later under the action of

light, after being printed from for some time, showing the well-known reddish or reddish-brown stains so difficult to remove, and sometimes it is quite impossible to do so, for generally what will dissolve or remove them will also remove the image itself as well or a part thereof. Perhaps the best thing to remove these stains is the following solution:—

Cyanide of potassium	5 grains.
Strongest liquid ammonia	10 drops.
Water	20 ounces.

This is applied carefully to the dry film with a tuft of cotton-wool or a piece of washleather to the stain until it is removed; the negative is then well washed and soaked in water for an hour or so, after which it may be wise to refix it in clean hypo solution, four ounces to the pint, as usual. The object of this refixing of the negative is to prevent the appearance of silver stains, which might otherwise put in an appearance later on through the gelatine film having absorbed some of the silver from the sensitive paper during printing. Never take even a proof from an unvarnished gelatine negative for obvious reasons. It is best not to wet the whole of the film with water previous to applying the cyanide of potassium solution, as then the film will not absorb so much of the solution around the spot near the stain as it might otherwise do, and perhaps dissolve some of the finest details of the image. If the above solution does not act quickly enough to please the operator he can make it stronger, but I prefer to apply a weak solution several times to using a stronger one, as its action is more under control and is stopped more quickly.

Now for the removal of the paper from the negative. Water must not be used for reasons already stated, neither must strong spirit be used either, because it dissolves the spirit varnish around the paper, and does not assist so much in the removal of the varnish as turpentine does, which I find far superior to spirit, because it does not dissolve the spirit varnish with which the negative is covered. It is a good plan to place the negative on a good retouching desk while the paper is being removed from it, as it is easier to see what one is doing then, and how the work is proceeding. In this way it will be found much easier to avoid cutting or scratching the film in any way, a very important thing to prevent. A piece of cotton-wool or washleather is dipped into the turpentine (that sold at oil-shops is suitable), and rubbed over the paper carefully, but briskly. The turpentine and the friction combined will remove the thinner portions of the paper usually, but a very sharp, thin-bladed pen-knife (or retouching knife would do) will be necessary to remove the thicker portions of the paper. It is used in such a way that thin slices are cut off the paper at a time; but, towards the close of the operation, which is a very delicate one, the thin portion of the paper still remaining may be scraped off carefully with the knife. An indiarubber ink eraser will also assist the operation from time to time. The paper must be re-wetted with turpentine every now and then during the process. If the paper is stuck to the unvarnished film, it is best removed as directed above, after which all the turpentine is rubbed off with a clean rag, and the cyanide solution applied to remove any red or brown silver stain there may be in or on the film itself. If there is none visible, apply for a

short time all the same, after which wash the negative well, soak, and refix in hypo, well wash, and, when thoroughly dry, varnish it with a reliable varnish. I prefer normal or enamelling collodion to any other varnish for gelatine negatives, although Hartley's Standard Celluloid varnish is, perhaps, superior to it. I have used both with good results. A very good substitute for any varnish is some good retouching medium, applied all over the film in the same manner as if it was going to be retouched all over. This forms a very good temporary protection to the film, while a proof, or even an order of six to twelve copies, are being printed from it; and, if, after a proof has been taken, it is thought that the negative can be improved by being reduced in density or by intensifying, the retouching medium is quickly and thoroughly removed by means of a rag dipped in turpentine being rubbed all over it, when the negative will be found as clean and smooth as it was previously. The great advantage of this treatment is cheapness, as a 1*s.* bottle will temporarily protect several dozen half-plate negatives, and the sensitive paper does not stick to it in the hottest sun unless it has been applied too thickly, or not allowed to dry properly in the sun or near a fire previous to printing from it. Staining the film is almost, if not quite, prevented by this treatment. If the negative is found all right as regards printing density, it can be retouched, if necessary, and then varnished with either of the varnishes mentioned above, which I believe to be the best it is possible to use for the purpose. Spirit varnish is removed with strong methylated alcohol.

A FEW TROUBLES AND THEIR REMEDIES.

By Arthur H. Pook.

A very convenient method of backing plates, and one that takes but a few minutes to perform, is as follows: Place two plates face to face and put them in a printing frame, fasten in the back, as usual, and then paint the exposed glass side of the plate with a caramel backing—the pure caramel recommended by Professor Haddon in last year's volume of the Almanac is undoubtedly the best—put on a piece of thin, unglazed, yellowish-brown paper, the kind one gets with one's shirts and collars from the laundress is very suitable, cut about one-eighth of an inch smaller all round than the size of the plate, remove the back of the printing frame, reverse the plates, replace the back as before, and paint the glass side of plate No. 2; another piece of the thin, yellow paper completes the work, and then one has two nicely backed plates, with a clean edge one-eighth of an inch wide all round. Personally, I have found this an exceedingly clean and expeditious method of accomplishing an important, but what is often, with good reason, considered a dirty and messy, operation. This method is a sure preventive for stray splashes, smudges, and drops, which so often find their way on to the film when applying the paint.

Uranium Intensification.—How many have not been troubled with unequal intensification when using this intensifier? This fault troubled me for a long time until, after some experiments, I traced the cause to small patches and films of grease from handling the negative. To remove this greasiness, I soaked the negative in a two or three per

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cent. solution of caustic soda, rubbing the surface of the film with a tuft of cotton-wool till its surface assimilated the water perfectly, then wash very thoroughly and intensify without first drying the plate. It is necessary that the washing be well performed, otherwise the cure will be worse than the disease, very minute quantities of caustic soda being a solvent for the uranium salts. I have found uranium a most useful intensifier for over-exposed and fogged plates, my method being, first, to reduce them with the ferricyanide bath to mere ghosts, and then washing well and intensifying.

Print Washing.—To refer once again to this time-honoured heme, it is, I think, at once obvious to any one giving the matter a moment's thought that, when occasionally changing the water in which prints are washing, one is only lessening in a certain percentage the amount of hypo originally taken up by the prints when in the fixing bath. Now, my object has always been to reduce the time spent on print washing to a minimum, but, at the same time, to ensure thorough washing and permanence of the prints. I, first of all, allowed the prints to drain for a time between each washing water; this reduced the water saturating the prints to a great extent, but, after a time, I found that by squeegeeing the prints face downwards to a piece of plate glass and then stripping off and putting into the fresh water was the quickest and surest way of eliminating hypo. After the fourth or fifth change of water, each of, say, ten or fifteen minutes' duration, the amount of hypo left in the prints will be a very infinitesimal quantity. Of course, this method is only applicable when washing a small number of prints at a time; but to those amateurs who prefer quality to quantity, I can thoroughly recommend it.

A very nice finish may be given to gelatine prints by squeegeeing them to a piece of Sawyer's temporary support, used in carbon printing, properly waxed and soaked in water. The two should be separated when 'bone' dry, and the result is pleasing to those who do not like too high a glaze.

Perry's spring paper clips are useful to clip on the edge of thickly coated and other plates that are inclined to frill badly in the washing waters; they have saved many a plate for me by being applied in time and preventing the frilling extending all over the plate.

DEVELOPERS FOR RAPID PLATES.

By Alfred Watkins.

'Use the developer recommended by the makers.' How often is this advice given in the reply column of a photographic journal? I am not sure that it is always right, and, from my own experience, I should say that some makers cut down the amount of bromide in their formulæ to a dangerously small amount, or even omit it altogether, and that it is almost impossible to get unfogged negatives with the developer as given when using the most rapid brands.

If you are getting thin or foggy negatives with rapid plates, it is well to considerably increase the amount of bromide, and not to curtail the time in the developing dish. I have used plates with which I found it

advisable to use an amount of bromide equal to the amount of pyro, but this was exceptional.

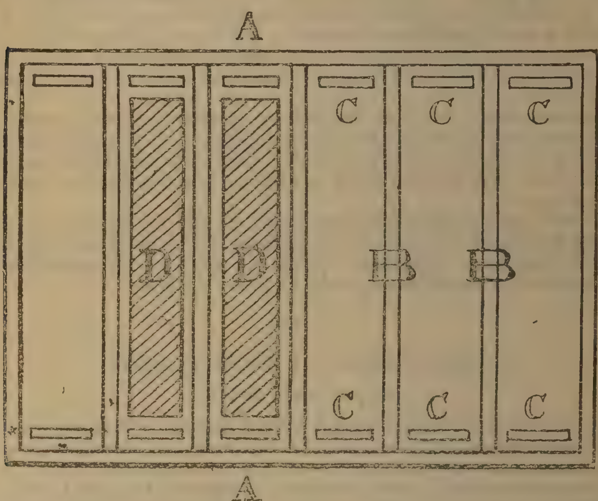
There is, perhaps, a reason for some makers curtailing the bromide, as by so doing they increase the apparent speed of their plates.

In a most interesting and valuable series of experiments recently published by Messrs. Cadett & Neall in *Dry Plates*, they found that they could get great increases in speed (Hurter & Driffield readings) with pyro-ammonia development by modifications in development, but that such increases were accompanied by corresponding increases in the amount of fog.

PACKING PLATES.

By Albert Levy.

It may seem as a step backward to speak now of packing dry plates, when so many seem to give these up and use films. Yet some of your readers may use dry plates of a size larger than half-plate, and like to prevent breakage as well before as after exposure. The usual packing of a dozen packages separated by straw I found very unreliable, as by stuffing it a little too hard one or two plates may be broken, and the ones



opposite scratched. Besides this, when only one dozen is needed, and must be replaced by another dozen package of exposed plates, it is very awkward.

I have, to prevent breakage and other trouble, used for many years, with uniform satisfaction, a box, of which I send you herewith a small

design. The size of this box is made to suit the size of plates. The view I show is from top; the lid should be screwed. A, shows the outside box; B, boards (thin), same width as the box of plates, but somewhat longer, and sliding easily in box; C, boards (thin), somewhat wider than thickness of box of plates, but as long as the box is deep; D are the dry-plate boxes. These fit nicely in the grooves thus reserved for them, and no breakage need be feared, as one dozen of plates does not touch the other, and is preserved all round.

I suppose that for convenience and easy handling a good many amateurs or others use ferro-prussiate paper to get proofs of negatives, and, for that matter, also professionals, for the reproduction of large designs or drawings for architects, &c. To those I would say that, when using good ferro-prussiate paper, by washing the prints twenty-four hours or so after exposure gives a nicer violet tone than the ordinary blue. When the paper is a little old, which means all the way from one month to two years, a longer washing is necessary, or until the whites appear clear, or very nearly so, as in the latter case they whiten somewhat while drying. In winter especially, washing with warm water hastens the results and often improves the print.

When printing from a negative (gelatine) which is not perfectly dry, or when, by some other reason, a drop of water sticks the paper to the negative, tear at once the paper off as much as possible, and immerse the whole plate in water, and soak well until the paper can be rubbed off gently; wash well under tap, and set up to dry, and generally no mark will remain.

CLEARING BROMIDE PRINTS.

By Harold Baker.

When using the new developers—hydrokinone, metol, &c.—for bromide prints, less care is necessary with regard to cleanliness than with the use of ferrous oxalate, and, as the prints continue to develop when removed to clean water, they are often passed straight from the developing to the fixing dish, and the hands become contaminated with hypo, which is liable to stain the next print. Paper that has been kept a long time will also show brown stains, with an irridescent appearance round the edges, especially in vignetted prints. When large numbers of prints are being produced, the loss from these stains is sometimes serious.

Some years ago I saw a method recommended by an American photographer for removing such stains, and I tried it with great success. I do not think I have seen it recommended by any English worker, but I have often found it very useful. Ferricyanide of potassium is generally recommended, but, in my hands, it always attacks the image, however dilute I have used it. The method I have found so useful is extremely simple. A dilute solution of cyanide of potassium is prepared, and to it are added a few drops of a solution of tincture of iodine, such as may be obtained at any chemist's shop. The prints are either immersed entirely in the solution, or it may be applied locally with a tuft of cotton wool. It is better to make a few experiments with a hopelessly bad print, as it is only possible to find out the proper strength of the solution from ex-

perience. An over-exposed enlargement with degraded whites can be sometimes saved by using a slightly stronger solution, and reducing the faint deposit of silver on the high lights.

By local application with a brush or cotton wool, it is possible to save a print that has been over-developed, or is too dark in places. I have never been able to reduce bromides with ferricyanide and hypo without producing a mealy appearance, especially if the print was on rough paper. This mealiness never shows when iodine and cyanide are used.

Its chief use, however, is for removing stains.

THE EXHIBITION OF 1897: AN IMPRESSION!

By Redmond Barrett.

Visitors to this year's Exhibition of the Royal Photographic Society cannot help but be struck by the specimens of portraiture now on view at Pall Mall. Their astonishment will not be caused—at least, I think not—by the super-excellence of the subjects themselves, but by their rarity. Personally, I was nothing short of amazed to see so few exhibits of portraiture, whereas some very few years ago matters were quite the other way. This must be looked upon as a very distressing fact, and most unsatisfactory state of affairs for many of us—indeed, I might say *all* of us—interested in or depending upon photography as an art or as a business. I think it well worthy of our attention and very considerably to our interest, to seek for the cause and remedy it. If left to go on in its own sweet way, I feel sure it will destroy our prosperity, as it now more than seriously menaces it.

Why should portraiture thus be relegated to a back seat when it should be in the forefront of all other branches of photography? Are the sitters to blame—or is Photography—or are *we?* The possibilities in this particular line are inexhaustible. Do we make sufficient use of them? I could name several that have never even been attempted by photographers. And why not? Perhaps they may have some sound reason which I do not know of, and so matters go on as nearly as possibly in the way they have always done. I feel confident it behoves us to be more alive to novelty—artistic novelty—and not plod along the beaten—well-beaten—track that has done duty and served our purpose for the last quarter of a century. There should be novelty and variety, in an artistic sense, to attract the ever-growing and improving tastes of those who, by their patronage, support photography. Experience teaches me, too, to insist that the prevalent over-retouching of negatives has tended to lessen the importance of portraiture, and is now looked upon with contempt by those who some while ago thoughtlessly accepted it. For a long time it did not seem necessary that a photograph should be like the original so long as it was a smooth and beautifully finished picture. If three members of a family were to sit, each bearing strong family resemblance, I don't think I am overstating facts when I say the best way to recognise each would be by the dress or the number on the back of the mount. Is all this as it should be? I dare to say it is not, the public have seen through it, and I back my opinion by saying that the house in London which has done the best business this season is one where *likeness* has *always* been

considered of the first and most vital necessity. This must mean something, and we should take it as an object-lesson. Better-class labour is necessary to produce good and striking portraiture—not so for highly-finished and smoothed-up photographs. In proof of this I can show photographs by very small photographers that will compare more than favourably with those by the best London houses, that look upon the smoothing style as the one most desirable. Likeness and high finish are not at all antagonistic, but they rarely go successfully together, nowadays. The cause is easily found if honestly sought for, and, I feel sure, is worth the finding. Let us hope a better state of things will rule by next Exhibition, and that the walls of the Royal Photographic Society will be covered as numerously as before by successful portraits, and so reinstate portraiture in the place it has lost—through no fault of its own. We can think it ours, but we won't say so.

THE TESTING OF MODERN LENSES.

By Philip Jourdain.

The testing of modern lenses against one another is a far more difficult matter than was the case with those to which we had become accustomed before the new order of things—Jena glasses and anastigmats—revolutionised the whole science, yes and art too, of photography.

The reason for this is that our modern lenses are very highly corrected, and the small differences of spherical, chromatic, and astigmatic corrections in different lenses are discernible only with difficulty.

It is also difficult to correctly estimate the field of a lens, as in some cases the definition falls off very gradually, and the question is, where does 'good' definition stop, and where does 'bad' set in? It is a hopeless task to compare different anastigmats in a general fashion, as hardly two species are constructed to fulfil the same object; in one, a large field is aimed at; in another, rapidity and good correction. For this reason, it is absurd to say that one kind is better than another; it depends on the work for which it is to be used.

However, there is no denying the fact that a systematic series of tests of all modern lenses would be of the greatest value, but each section must consist of comparative tests made with respect to one quality or one kind of correction only for the reason stated above.

The qualities, good or bad, of any lens, come under the following headings :—

I. *Rapidity*, depending on (a) the diameter of the efficient incident pencil, *not* on the diameter of the largest stop; (b) the number of reflecting surfaces; and (c) the number and thicknesses of cemented elements.

II. *Angle covered* with various apertures with absolute sharpness. Some standard of sharpness must be employed for this test.

III. Chromatic aberration.

IV. Spherical aberration.

V. Astigmatism.

VI. Distortion.

VII. Flare spot.

VIII. Illumination at different parts of the field.

IX. Mechanical defects.

X. Other properties, such as that of providing two or more focal lengths in one instrument.

Such a table, including in each section all the known modern lenses, would be valuable from every point of view; but chiefly as a reliable guide to the selection of a lens for any particular purpose.

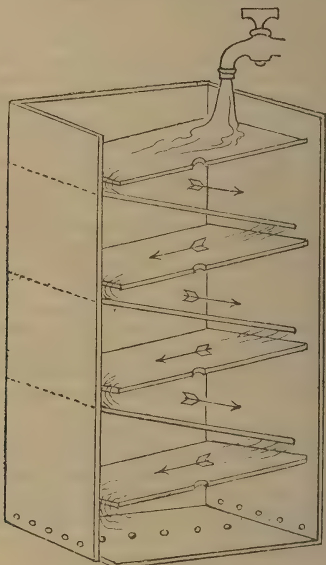
Someone is needed to carry this out; someone who is competent to do so, and whose opinion would be valued. No one, I am sure, wishes this more than do lens makers themselves.

A ZIGZAG PLATE-WASHER.

By G. G. Mitchell.

I wish to describe a very simple, but very efficient and compact, washing box for negatives. Any one with even rudimentary skill in carpentry could make it for himself.

Say that a half-plate washer is wanted. Put together a simple box of the pattern shown in the diagram, or adapt any likely one for the purpose. Let its internal lateral capacity be a trifle larger than the size



of plate to be washed, say, 7 × 5. The top requires no covering, and one side must be either hinged or removable. Fix on alternate sides of this upright box six or more sloping shelves, one over the other, as

shown, allowing half an inch or so free space at the lower end of each for the escape of water to the next plate below, and on these inclined planes place the fixed negatives, which can be kept from slipping by a couple of small pins. Replace the side, and, standing the box in a sink, turn on the tap, so that the water will fall on the top shelf, and rush downwards over each plate in succession, thus quickly carrying off the hypo, which may be allowed to escape by a perforation at the bottom. It is obvious that smaller sizes can also be washed in this box. A notch in the edge of each shelf permits the easy removal of the negatives.

It is unnecessary to make such a washer quite tight at the joinings. It will be sufficient to provide that the stream of water properly floods each plate in turn. If desired, the inflow and outflow can easily be adjusted to keep the box full, while, at the same time, the rush is downward, carrying the heavier hypo with it.

Dimensions are not of much consequence so long as efficiency is secured. A space of three quarters of an inch between the foot of one plate and the top of the next under it is suitable, and any ordinary number of negatives could be accommodated by constructing the shelves to hold three or more each.

This plan of washing keeps the work safe from damage when a lot of plates require attention at once, instead of having them distributed under different taps. A box made for whole plates and under would be most suitable for studio use. Not the least valuable feature in this washer is the direct and active impact of moving water over the face of each plate. The mere placing of a batch of negatives in a large vessel with an inflow which finds its exit anyhow is little better than soaking them. In the zigzag washer they can be depended upon for being well and quickly washed. In the case of a strong rush of water the top shelf should be empty.

THE KEEPING QUALITIES OF FILMS.

By Harry Selby.

It would be highly instructive could we obtain an authoritative opinion upon the effect of exposure to light upon the keeping qualities of an emulsion. A remarkable article recently published in a contemporary has a tilt at the question as regards celluloid films, and the presence of certain chemicals in the film support is strongly hinted at as being at the bottom of the mischief which frequently occurs between exposure and development. But the mischief is apparently not confined to celluloid films. I remember some years ago exposing some dozens of half-plates, manufactured by a well-known firm of high repute, and finding, on developing them, curious markings along three sides of the plates. I showed some of them to Mr. J. Desiré England, who was at that time well known as a plate maker, and he informed me that the defect was due to a fault in the drying of the emulsion. He also said that if the negatives were developed *very soon after exposure* the defect would not appear. This opinion was verified by the fact that six which I developed two days after exposure were free from the phenomenon, whereas the remainder, which I was prevented from developing for some six weeks

or more, were all, without exception, afflicted. Now here is a case in which the time which elapsed between exposure and development was a factor. It is true there was a disease to start with, viz., the uneven drying of the emulsion. But still the question has to be answered, 'What was the nature of the action of light which went on as it were gathering strength gradually?' Why did it not show in the negatives developed immediately after exposure?

It is certain, beyond all doubt, that in the case of celluloid films the deterioration of the emulsion after exposure is much more rapid than with glass plates, and I believe I am not wrong in saying that it is more so with rapid than with slow emulsions. It certainly is my own experience, dearly bought. The tendency appears to me to run in the direction of producing insensitive spots, of apparently the same nature as those observed frequently in stale plates. But I am also inclined to agree with the writer of the article to which I have referred (I think I am not wrong in stating this to be his contention—I have not his article before me) that the effect is towards fading of the image—in other words, slowing of the emulsion. I have certainly found on developing rapid films, which have had what should be undoubtedly over-exposure, evidence of unmistakeable under-exposure—I speak of cases where some weeks have elapsed before development has taken place. No doubt, in order to put the matter on a scientific basis, it would be necessary to expose some half-dozen films on the same subject, with the same exposure, and at the same time, and develope them at different intervals of time. The effect could then be watched and carefully noted. If the pyroxylin in the film is at the bottom of it, it is a matter of some importance to discover if some non-conducting film could not be interposed between celluloid and emulsion. It is a question more for the chemist than the photographer, but it is a matter that largely affects the latter, and if some means cannot be discovered of first localising the mischief, and afterwards nullifying it, there is no doubt it will seriously affect the future of celluloid films as against paper or glass. The many advantages which films possess are not sufficient to outweigh the evil of uncertainty which now besets the path of the worker with celluloid.

DISHES.

By H. Hands.

Dishes are as necessary to the photographer as is clay to the brickmaker. 'Of course,' you will say; 'tell us something we don't know.' Happy is the man who has a plentiful supply. But you do not want bare aphorisms, and past experience having taught you that the Editor accepts no nuts without kernels, you naturally wonder how long it is going to take me to get through the shell of this one. Here it is.

Take one—or a dozen, according to requirements—kerosine oil tins; empty, of course. Or, as an alternative, a piece of zinc lining of an old packing-case. If it be unrusted and the coating of tin intact, all the better. Cut up the tin into square pieces large enough to take one, two, or more plates of the size you work, *plus* each way twice the depth you wish them to be. To make the matter plain, let us suppose you want

dishes for half-plate to be three-quarters of an inch deep. Cut your pieces $8\frac{1}{4} \times 6\frac{1}{2}$ inches, and mind they have been cut perfectly rectangular. Now clean the flat pieces with Monkey Brand Soap, or wood ashes; wash

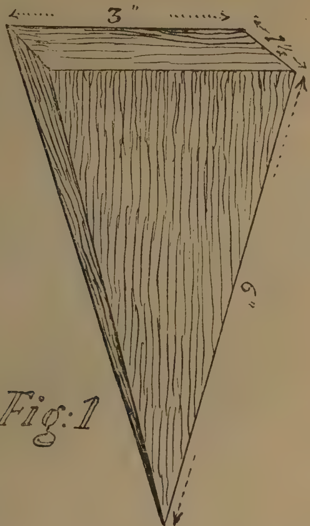
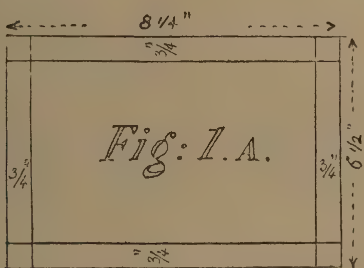


Fig: 1

and dry. Mark off with straight lines three-quarters of an inch from edge, fig. 1A. You now require a tool like fig. 1. It may be iron or hard



wood, preferably the former, and must have straight and square edges at its thick end, if you want to do your work nicely. I have given what I think should be the *minimum* size, a larger one would be better. The

sharp end is pushed into the ground, or dropped into a hole in a bench or table—anywhere convenient so long as it is firm and does not wobble about. This is for knocking up the edges of the pieces of tin, and is used as shown in fig. 2, its edge coinciding with the lines marked off on the plates, while the marked-off margin of the latter are hammered down as shown. The tin plate must be pressed firm and flat on the top of the block, fig. 1, or it will 'spring,' and then it will be difficult to get the dish flat. Don't hammer down the sides with heavy blows. You must first hammer it gently along each side, so as to get a sharp, clean angle. This is managed by seeing that the marked line on the tin plate is exactly

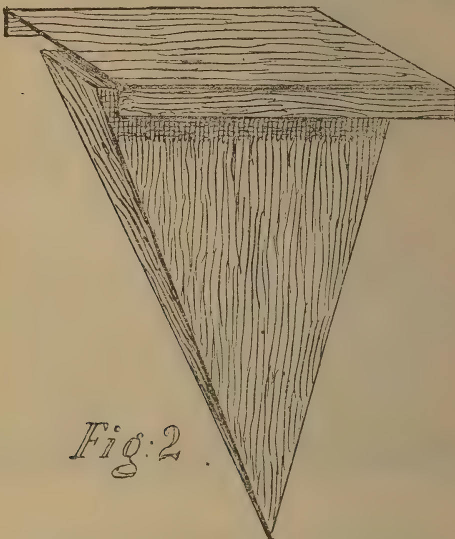
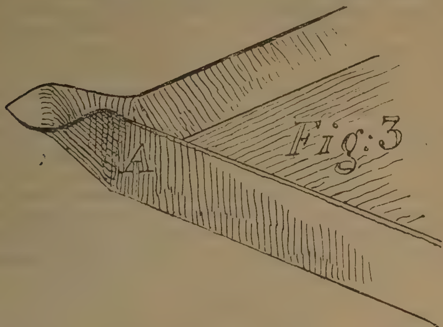


Fig: 2

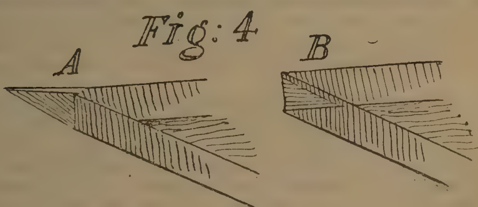
on the edge of the block, pressing well down on the latter, then tap along the tin, striking it at the marked line. This will cause it to bend slightly over, and the angle will be clean and sharp. Go round the four sides in this way. Keep going round the plate, bending the edges down *a little at a time.* You will now find the corners bulging. You must now place one corner of the dish fair on the corner of the block, and fashion the lip for pouring. This is done as follows; only *two* lips need be made —diagonally opposite each other. The corner of the dish being flush on the corner of the block, give the tin a tap first one side the lip, then the other, alternately. The lip will continue to bulge out. Continue this till the angles of the lip marked A, fig. 3, nearly meet. Your hammer must have a face of small diameter, so as to go into this angle. Next fashion the other lip in the same way. You need not be a tinsmith or an expert. Tap carefully at the place marked A, on each side the lip,

and you will be surprised to see the lip take shape itself, as it were. The other two corners can be hammered up close to the corner of the block, and then doubled over to one side and hammered flat, as shown at A and B, fig. 4. Having fashioned the corners, hammer down the sides to



the angle desired, either straight or sloping. The dish being fashioned to your liking, give it another scrubbing with soap or ashes; wash and dry. Melt equal parts of pitch and common resin in an empty jam tin (well cleaned), or any suitable vessel; hold your dish with pliers, heat well, and brush the melted and hot mixture all over it as evenly as possible. Keep the dish near the fire while coating it. Then put aside to set and cool. It is as well to give it another coat of the mixture as soon as the first is well set. For knocking up the sides of the dish the family flat iron may be used as a makeshift, and the largest pair of family scissors may be successfully used to cut up the tin, but, if you are married, your standing in the house will decide what risks you run in doing so.

Larger dishes—and deeper—for washing prints, and for all work except toning, may be made in this way. For fixing and alum dishes the coating of pitch mixture must be thicker than for other work, and an



eye must be given to see that the coating is in all cases always intact. If chipped at all, clean the dish well, and give it a fresh coat. I do not mean that the old coat need be removed, but that it is freed from grease, &c. *Heat well* before re-coating; you will then get it quite even.

It is an excellent plan to mark each dish so as to denote what it is used for. For instance, out of fairly thick paper letters, as P=pyro; H=hypo; T W=washing prints for toning; H W=washing after fixing. Stick these letters on the bottom of dishes (*not* inside) after the first coat of pitch mixture, and while latter is still hot and soft. Then the second coat will cover and protect them. Being a little in relief, they can be both seen and *felt*. The latter circumstance is useful in the dark room.

A word of caution may be necessary to some in regard to the mixing of the coating mixture of pitch and resin. The resin should first be melted in a vessel considerably larger than would be necessary to hold the quantity of the mixture it is proposed to melt down; I use a kerosine oil tin. The pitch is then added a little at a time. If the pitch be melted first and the resin added all at once, in a few seconds the mixture will rise and flow over the sides of the vessel into the fire, and cause a flare-up that might prove serious. To coat dishes of small size I do not use a brush, but, after melting the mixture and heating the dish, I dip the latter into it with a pair of pliers, and let the surplus drain off. The mixture will be found a first-class coating for developing and washing sinks.

EXHIBITING ANIMATED PHOTOGRAPHS.

By G. R. Baker.

When the cinematograph was first introduced, operators had some difficulty in keeping the film in perfect register, especially on first starting the subject, although the greatest care was taken to see that the pins of the sprocket wheel engaged in the perforations of the film and the clamp, rocker, &c., were properly attended to. With improvements in apparatus and extra care in cutting and perforating the films, this has been neutralised to a great extent, but that it has not been entirely overcome is emphasised by the fact that in an otherwise good display I witnessed the other evening at a small public hall, one film failed by jumping out of position after a very small portion had been shown. As a result, it was shut off, and another film was shown. If a little attachment I had made for an apparatus I was interested in some time ago had been in use, the film could have been readily readjusted, and, what is more, tested without the audience seeing the result. As this attachment is useful in all delicate projections, where the demonstrator is anxious to know if the result is as he desires it to be before showing the audience, I will describe it.

After fitting up any apparatus for projection and focussing it for the screen, a miniature of such projection can be obtained by placing a convex lens of moderately short focus (say three inches) in front of the ordinary objective, and holding a piece of card, blackened paper, or metal, according to the intensity of the light rays, at a postion that gives a sharp image of the projection. This will be found, with the lens mentioned, to be about four inches from the lens. A good method of attachment is to cut an aperture in the ordinary flashing shutter of front, let in a cell, and in this fit the lens; then fit a little boss below, and into this adapt a tube or square, on which a sleeve will slide carrying the

miniature screen, and which can be thus brought nearer to, or further from, the lens, so as to get an exact focus.

In practical work the film will be put into position, the light turned on, and, with the cap of objective closed, the light passes through the convex lens on to the miniature screen, which need only be just large enough to focus the small picture, and prevent the rays passing on to the regular screen. The handle of the cinematograph can now be turned for a few of the pictures to be projected on the miniature screen, and, as soon as it is seen that all is satisfactory, the shutter of the objective turned aside, and with it the lens and miniature screen, and the rays allowed to pass on to the regular screen in proper focus for the audience to see. Another method of attaching this lens is to mount it in a cap that will slip over the front, and have a small wooden or metal screen hinged or supported from the lantern baseboard.

Another point that cannot be too strongly emphasised is that no cinematograph should be used without a water trough between the light and the film, for, although there is not much danger if the film is only allowed to remain in the focus of the rays for a second or two, it might be that the operator, by omitting to insert the shutter or metal mask to shut off the light, left it exposed for some time, and then the film would catch light, as it did at a place near Bradford, and, if the subsequent development was the same, a panic might ensue. According to the local reports given as the results of an interview with the operator, the film, after catching fire, broke away and fell into the basket below the apparatus containing the used films, with the result of a fizzle and flame that those who know how celluloid burns can realise.

If any readers of this have not seen the celluloid film, as used for photographic work, burn, let them take a small piece and put it on a plate or stone, and set fire to one corner with a match, and then they will understand why there was a panic when hundreds of feet flashed away on being ignited. The conclusions are—(*a*) Always use a water trough; (*b*) have a winding-up reel or apparatus, as in the biograph and in some of the cinematographs; (*c*) or if the used film falls into a box or basket, have one receptacle for each film, and this fitted with a cover that will prevent more than one film under any circumstances being affected. As regards this last precaution, it is necessary, from a £ *s.* *d.* point of view, for, with "all the eggs (films) in one basket," the loss is great when an accident happens, and 20*l.* goes to smoke in a few seconds, in fact, almost as quickly as a bank note for that amount could be burned.

BACKED PLATES, DRYING AND CLEANING.

By J. S. Teape.

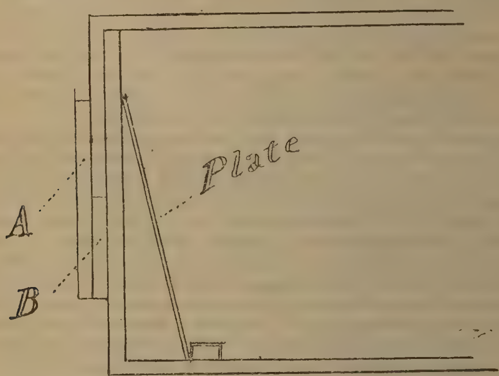
The value of a backing for sensitive plates is slowly, but surely, becoming recognised by all photographers. The very great improvement in results is a matter quite beyond dispute. In the matter of making a backing and its use, and the ease with which it can be done, opinions differ, hence I have ventured to describe my mode of doing it, which I consider easy.

The troubles of backing plates have engaged the minds of several

photographers during the past year. The difficulty of removing the backing appears to have been an item of considerable anxiety when collodion was the medium used. Now, why use collodion, or any other inferior backing, when there is one which it will be impossible to beat, if to equal? That one to which I refer is caramel. Oh, that messy stuff! Yes; but there is no need for any mess if only a little simple system is followed, which I will try to explain further on. I have not found anything to equal it in all my experiments but asphaltum, which is rather too much trouble to remove.

The efficiency of caramel is ample return for the small extra work in making it, which you must do if you want the best. The matter of efficiency brings to my mind a show of lantern slides from negatives by a renowned photographer. In several of the subjects a very large amount of halation was present. The plates had been backed, but not with caramel.

Among the photographers I have met who have not attempted to back their plates, several have been prevented by the necessity for a drying cupboard. Here is a very simple way of meeting this difficulty. Get a strong cardboard box an inch deeper than the longest measure-



ment of your plates; run over the corners inside with black paper, to be sure it is light-tight. On the bottom, inside, glue strips of cardboard, half an inch wide, a short distance from the sides of the box, to prevent the plates from slipping when stood up against the sides. By placing the plates in this way a good number can be put into a small box. The next thing to do is to make the lid light-tight, which is easily done this way: Under the edge of the lid, when on the box, glue strip, B; on B glue A, covering over the edge of the lid an inch or more. When the lid is put on, it will slip into a slot made by A and B. A box like this is very useful during the winter months, as, if your dark room is not warm, you can take it into a warm room to assist the drying of the backing. The other parts of the operations are the coating and cleaning off of the backing. I strongly advise the use of a two-inch hog's-

hair brush for coating all sizes of plates. This should be lightly charged with the solution, so that a thin coating is given. It is important to remember that a thin coating is effectual when caramel backing is used. If I want the plates in about half an hour, I see if dry or not; if not, they are generally dry enough for the application of sheets of common tissue paper, which I always apply. If the plates are dry, I breathe a little on the backing, which quickly creates a tackiness enough to cause the tissue to adhere. The paper is easily cut to size by folding a few sheets a little larger than the plate, placing the glass plate on the paper, and cutting the lot round with the scissors. After the exposure, I take a jug or dish of water and a sponge, moderately charge the sponge with water, and wet the tissue all over; by the time you have put the sponge down you can take the tissue by the corner and pull it off, double up the paper with the fingers, and rub off the backing with it. Press water out of the sponge, and finish the plate by a few strokes. All this takes much longer to write about than it does to do it. The use of the tissue I can highly recommend, as it enables you to put the plates into slides before the backing is dry, and to simplify the removal of the backing.

THUN FOR THE CAMERA.

By Rev. E. Healy.

Having been asked by the editor for a short contribution to our Almanac, I cannot do better than describe the advantages to the photographer of a sojourn at this charming little town. Thun is too often merely passed on the journey between Berne and Interlaken, or sometimes the transient visitor, being obliged to spend a night or part of a day there, describes the place as a 'dull hole.' But I am sure that there is in Switzerland no more enjoyable spot for a week or a fortnight's stay than pretty little Thun. First, there is its beautiful lake, with the giants of the Bernese Oberland towering up at the end of it; then the glacier-fed Aare, dashing with its emerald-green waters through the town, like the Reuss at Lucerne; while at every corner in the town the photographer comes on the most charming 'bits'—much more numerous than in Lucerne. Let him mount the covered steps to the old twelfth-century castle and the church, from whence he will view the town stretched below him, and, beyond, the lake, with the ranges of the Stockhorn and Niesen and the snow-clad giants in the distance. On the market-day there is any amount of studies in costume and picturesque country groups.

The railway, to Berne in one direction and to Interlaken in the other, and the steamboats on the lake give every facility for excursions. For instance, by starting early in the morning one can go to Interlaken, up to the Lauterbrunnen valley, over the Wengern Alp by mountain railway to the height of 7000 feet, passing within three miles of the Jungfrau Mönch and Eiger, descending to Grindelwald and down its valley to Interlaken, and thence home to Thun in time for supper. For those who like to tramp about, the steamboat or railway will drop you at any of the lakeside stations, whence you can mount up to St. Beatenberg, or stroll up the valleys of the Kander or the Simme, finding a superabundance of subjects for the camera in the way of mountains, châlets, rushing streams,

and rocky gorges. Again, should you be disposed for a modest climb, there is the Niesen, 7000 feet high, practicable for a hand camera, as there is a bridle road nearly to the summit, which commands a view as fine as that from the Rigi or Pilatus. Closer, in the town, there is a walk through the pinewood at the back of the Belle Vue Hotel, which in about ten minutes brings you to a summer-house whence you see the whole range of the snow-clad Bernese Alps from the Finsteraarhorn to the Doldenhorn spread before you. But I must pause, only observing that you can be lodged and boarded at the famous Pension Itten at the cost of five francs a day (this is about five or six minutes out of the town); while at the Hotel Belle Vue you will find as good accommodation as at any of the 'swell' hotels at Interlaken for about eight francs a day.

N.B. at the latter hotel there are *two* dark rooms.

THE AERIAL FOCUS.

By J. Leisk.

Understanding that contributors to the Almanac do not necessarily supply original matter, but rather write from their experience of things photographic for the benefit of their less advanced brethren in the art, I do not apologise to 'those who know' in choosing the above subject, for I can remember when someone writing on photo-micrography said that in focussing he dispensed with the ground glass of the camera, and put a plain glass in its place, using the *aerial focus*, I had to confess I did not know how it was done, and finding that my friends could not enlighten me, I had to cypher the thing out for myself as best I could, since when I can hardly overstate the advantage it gave me when absolute sharpness of definition is required, such as in copying or in taking subjects for stereoscopic work, the lantern, or for enlarging.

It goes without saying that the aerial focus of the lens lies in the same plane, and coincides with the image on the ground glass of the camera when the latter is sharply focussed. But how can we tell when it is absolutely sharp? The best that can be done with ground glass may only be a compromise, as I will presently show.

Let us, in the first place, render a spot near the centre of the ground glass transparent by cementing on a microscopic-slide cover glass on the ground surface with a drop of Canada balsam, and then we shall select some printed matter, such as a poster or hand-bill, just too far off to be read with the naked eye. Adjust the camera towards it, carefully focus, and examine the image on the ground glass with a powerful lens of *not more* than half an inch focus, when, instead of the letters, all one will see is the rough surface of the glass much magnified, with possibly a very indistinct trace of words thereon, while turning the focussing screw either way will make little or no improvement.

If, now, we take the magnifier, the focal length of which we will assume is exactly half an inch, adjust it over the clear spot in the glass, and exactly half an inch, *minus the thickness of the glass*, therefrom, its focus will, of course, lie in the same plane as the further or ground surface of the glass. Now let one place his eye *close* to the magnifier and examine the image of the distant poster. If, *by chance*, it has been

correctly focussed, he will be able to read the words with ease; if not, a turn of the screw will make them perfectly distinct, and he will be astonished to find how a small movement of the screw will either blur or sharpen the image.

Now, what he has accomplished is, to bring the aerial focus of the camera lens into the same plane as that of the focussing lens, through which latter the image of the poster is seen, much magnified, of course, and so details too distant to be seen by the eye are rendered clearly visible; in other words, the two lenses form a compound telescope (minus the second or erecting eye piece). and, as the ground glass and future sensitive plate occupy the exact plane where the foci of the two lenses meet, the resulting negative will be absolutely sharp, and will stand enlarging up to any reasonable extent without fuzziness or loss of definition.

In practice, the focussing lens *must* be of *short* focus, otherwise it gives too much latitude, and may best consist of two double convex lenses mounted a short distance apart in a tube which slides or screws into another, so that its exact focus can be found in the following manner, and when so adjusted it is better to have a binding screw to fix the tubes in that position for future use.

Place a scrap of gauze or fine net on the window pane, cover it with a piece of common glass as thick as the ground glass of the camera, place the tube of the focussing lens upon it, and focus the gauze sharp through the glass. If now applied to the camera ground glass, its focal plane will exactly coincide with the further or ground surface of that glass, and when placed over a transparent spot, will show the aerial image when it falls in the same plane.

Focussing lenses as described are sold by opticians, or one of the lenses mounted on a tripod, having a screw adjustment, and which are used for examining flowers, will answer the purpose.

As the ground glass will still be wanted for composing the picture, two spots on it can be rendered transparent as described, one near the centre, and the other near the margin, or the ground glass can be removed, and a plain glass, coated with matt varnish, substituted—the transparent spots made by scraping off the varnish. I have tried both methods with success.

THE FOCUSSING SCREEN AND ITS SUBSTITUTES.

By Rev. F. C. Lambert.

By focussing screen we here mean the ordinary ground glass which we are accustomed to use as a focussing screen. Now, it must be within the experience of most people that to be provided for accidents seems to prevent them happening. Therefore, as to the photographer, it may be well for him to be provided with some makeshift or substitute for the broken ground glass, so that his foresight may act as a charm against the accident happening.

The following have been suggested and are efficient in varying degrees :—

1. Common ground glass, such as is usually obtainable at the glass-

cutter's shop in most towns and large villages. This, rubbed with oil, glycerine, vaseline, or other non-drying fluid, does very well for the time.

2. Common glass, dabbed over with putty.

3. Ditto, varnished with any clear-drying varnish, and then grained with a bit of rag dipped in powdered pumice-stone or powdered glass, &c.

4. Ditto, (*a*) coated with matt varnish, or (*b*) coated with gelatine dissolved in milk—say, twenty grains per ounce—and applied in the old collodion style.

5. An undeveloped gelatine plate is fixed, washed, soaked in a ten per cent. solution of barium chloride, rinsed, and then bathed in sulphuric acid (five per cent.). This precipitates barium sulphate in the layer of gelatine.

6. A plate is exposed to daylight for a second or so, developed, fixed, washed, and bleached in saturated solution of mercuric chloride.

There are still a few other substitutes; but, with these half-dozen arrows in one's quiver, it is hardly likely that some one of them may not be used in case of emergency.

A FEW INDIAN WANTS.

By Geo. Ewing (Calcutta).

Wanted, a medium for the publication of the needs of Indian amateurs. To some this may appear a strange want, considering that there are already in existence Indian journals avowedly devoted to the interests of amateurs in the East, but the wonder will disappear if the papers are themselves consulted. Whatever may have been their original purpose, their conductors have transformed them into records of aimless voyages and travels, and are now, in a lucid interval, endeavouring to infuse variety with pointless cycling notes. Certainly not by such means will the sympathies of that noble army of men who minister to our wants be enlisted on our behalf. That will be possible only through the unparalleled circulation of the Almanac, and in it therefore I crave a little space for the specification of our requirements.

Wanted, steel camera cases. Dealers, in persisting in sending us camera cases of leather, wood, and canvas, must be either very conservative or very oblivious of Indian exigencies. Very little knowledge of this country should show them that the age of iron has set in. Whereas a decade back travellers pinned their faith on leather portmanteaus and Saratoga trunks, steel trunks alone are now considered suited to the accidents of Indian wayfaring. Wood is apt to attract white ants, leather is heavy and expensive, and canvas is no protection against hard knocks and rough usage. Steel, on the other hand, is light, strong, cheap, and a perfect safeguard against the thousand-and-one pests and dangers attendant on campaigning in the East. Painted or varnished, it will *not* rust, let cast-iron cretins say what they will; but, unless a demand is created, it will be impossible for amateurs to obtain their wants at reasonable rates. When I was in England last year, I tried ineffectually to get a well-known steel-trunk manufacturer to make me a dust and damp-proof case for my 15 × 12 camera at the price charged for a uniform case of the same capacity. I was told that the cases obtainable commercially for a few shillings were priced low, as they

were made in regulation sizes by thousands, and that variations from the standard dimensions raised the rates enormously. Obviously isolated amateurs cannot give large orders so as to raise the usual photographic sizes to the dignity of trunkmakers' prototypes, but dealers can.

Wanted, less brass and more honesty. If the steel boxes are, like uniform cases, made damp and dust-proof, that terrible bogie, the Indian climate, may be defied, and brass bindings relegated to the limbo of useless photographic fads. I have for years held that brass binding is not necessary for India when *good seasoned wood was used and the workmanship was honest*, and I shall die in that faith. The cases brought to my notice of unbound cameras going to pieces during the monsoons have only proved the necessity for honest carpentry, and not brass binding. When I was in Europe, I got a little-known maker to make me a large camera of the latest pattern, but with no metal binding. The man at first positively refused to 'risk his credit' by following my instructions, and it was only when he saw that he was in a fair way to losing the job that, 'for his own reputation,' he made me the camera with finest Spanish mahogany and extra strong joinings without brass. The camera is now before me, as good as ever. Cannot others use 'finest Spanish mahogany and extra strong fittings?' Brass, like charity, cloaks many sins, and its absence will be the best guarantee of honest work and materials. Nothing else will do for India.

Wanted, centre-draught lamps for optical lanterns. I have often seen advertisements of 'Indian-pattern' lanterns, fitted with oxyhydrogen jets, platinum prints, lime adjustments, gas bags, retorts, &c. They are about as useful to us as breeks would be to the traditional Highlanders, or flannel shirts to the natives of Central Africa. Dwellers in the East must, for years to come, depend on petroleum, and that maker would score heavily who, recognising this fact, would give us oil lamps on the centre-draught principle. For years all the centre-draught lamps in household use in India were 'made in Germany,' and English manufacturers reluctantly followed only when the lamp trade had almost slipped from their hands. Will nothing short of a German invasion lead them to give us also centre-draught lamps for our lanterns?

NEGATIVES BY POST.

By S. Herbert Fry.

Every photographer wants occasionally to transmit negatives by post. The following 'negative' rules have been found to ensure safety:—

1. Don't nail the lid of the box, if a wooden one. A tightly strung box is quite secure enough. Negatives are often damaged by a clumsy person when opening a nailed-down lid.

2. Don't write the name of the addressee on the package itself, but on an attached tag label. The postage stamps must be attached to the label. The Post-office officials are only required to obliterate the stamps, and not to smash up the box.

3. Don't pack so that the contents are loose and can be shaken.

4. Don't use *crumpled* paper, or sawdust, or cotton-wool for packing. The best thing is corrugated packing-paper, cut to drop into the

box. The next best thing is ordinary brown or newspaper, cut to size, and used quite flat. Brown paper has no reading matter upon it. This often saves time.

5. Don't worry about wood boxes. An ordinary cardboard box, with a piece of 'eight cut' backboard on each side, makes a safe parcel.

6. Don't omit to put a name and address inside the box, in case the tag label is torn away.

7. Don't forget to put a Post-office 'Fragile' label on the parcel to comply with the Post-office rules.

8. Don't attempt to send negatives by letter post.

TRADE UNIONISM ONCE MORE.

By J. A. Randall.

On receiving the Almanac of last year, I was flattered to discover that directly and indirectly I had been the cause of monopolising eight pages of the Editor's valuable space. My first elation, however, was somewhat discounted when I found that seven of the eight were from the pen of that redoubtable gladiator Mr. Arthur G. Field of Maidstone, who was 'pitching into' me and my trade unionism. Some readers may have thought that the pages had been better occupied, though I need hardly remind such that the subject of trade unionism is of considerable importance to thousands of photographic assistants. For this reason I return to the matter, trusting that those who find no interest in trade unionism will not begrudge me a few pages.

'Why take the Almanac?' you ask. I answer, because I have a lively recollection of the time when the Almanac was the only photographic literature in which I indulged, and knowing also that many photographic assistants who rarely take up a photographic periodical yet make it a kind of religious duty to purchase and read the Daniel Lambert, the fattest and weightiest of photographic annuals.

In the article referred to, *A Trade Union for Photographic Workers*, Mr. Field states a grievance against me, and proceeds to criticise my work, *The Photographic Worker*, the grievance being that in this pamphlet I had simply recapitulated his writings on trade unionism in The British Journal of Photography and elsewhere during the years 1889–91 without acknowledging the authorship, not so much the literary form as the ideas put forward.

This recapitulation I deny, and also deny that I have any desire to rob Mr. Field of the right in ideas he thinks essentially his own; furthermore, had I have imagined he claimed such a right in what are the elements of trade unionism, I should have refused absolutely to recognise the claim. My pamphlet puts forward nothing, nor are the parallels Mr. Field gives to make good his case anything, beyond what has been the common property of advanced organizations for many years previous to 1889. Besides this, I neither claimed the originality of applying trade unionism to photography nor private property in the ideas set down. This being so, it is difficult to determine the rationality of Mr. Field's protest. What my objector forgets is, that he has first to make good his title to be regarded as the originator of the principles of trade

unionism before he can demand the slightest acknowledgment from an author. This he has not done, but assumed a virtue though he possess it not.

The most that can be urged against me is that I did not mention Mr. Field in this connexion, though I had already done so in The British Journal of Photography, April 19, 1895, as follows: 'The formation of a Photographic Assistants' Union, as suggested by "Assistant," to deal with instances of injustice as I described under *A Hard Case*, was attempted a few years ago. A full account can be found in the Journal of 1889–90. This attempt was headed by Mr. Arthur G. Field, and failed mainly through the indifference and non-support of assistants themselves.' Mr. Field would like to have seen these facts repeated in *The Photographic Worker*. So would I until I read an article of his in the Almanac of 1894, where he wrote of this attempt as follows: 'Our *fiasco*, which seemed very serious then, but which time has softened into the aspect of a burlesque tragedy, was not hailed with great exultation by the employers.'

Reading this, I decided to omit any reference, knowing that a person of Mr. Field's sensitiveness—a sensitiveness that leaves gelatine dry plates far behind—would prefer to forget that, in callow youth, he was the leader of this '*fiasco*' and 'burlesque tragedy.'

This little personal matter disposed of, Mr. Field proceeds to make clear the 'remarkable continuity of this movement for unity among photographic workers, and its identity under its various phases and its different spokesmen.' As my critic says, I deny this identity, and even go so far as to assert that the unionism I advocate is opposed, 'in aims and in ways and means,' to the earlier form. To bring out the identity, Mr. Field compares passages from his own writings with others from my pamphlet; but these comparisons, as I stated above, prove nothing beyond the fact that on certain objects, common to all trade unions, the stock in trade, we are, and must be, at one; he has still to compare the larger part, *i.e.*, aims, policy, ways and means, and, most important of all, finances.

Following Mr. Field's example, I also will give a comparison. In the Journal, December 6, 1889, he defined trade unionism as under: 'A trade union, that is to say, an organization open to every operative photographer in any branch, subject to a technical qualification, founded for the support of the workman in trade disputes.' In the *Photographic Worker*, page 21, I wrote thus of trade unions: 'The aggressive side of trade unionism is of necessity the most pronounced, and gains an undue importance in consequence; in reality it is only a small part of the many functions that a trade union performs. A well-organized union will attend to every phase of a worker's life which has any connexion with business, in a less degree with his social life, and in no way with the religious life.' From these two quotations it is obvious that, whereas Mr. Field considers a trade union as founded mainly to support workmen in trade disputes, I regard this as only a small part. How two schemes can be identical in which the chief business of one becomes a comparatively unimportant detail in the other, I leave with my critic to make clear.

This difference may seem trifling at a first glance, but in reality it is vital. The test of any organization, whatever may be its professed

principles, is the manner in which it proposes to spend its income, I give in tabular form three statements—(1) as Mr. Field proposed; (2) from the *Photographic Worker;* (3) compiled from the report of the National Union of Shop Assistants :—

	1.			2.			3.		
	£	s.	d.	£	s.	d.	£	s.	d.
Branch expenses	0	5	3	0	5	8	0	7	0
Central "	0	4	4½				0	4	0
Legal protection	0	1	9		—			—	
Trade "	0	6	1½		—			—	
Unemployed	0	1	9	0	14	4	0	12	0
Balance	0	0	10½	0	2	3		—	
	1	0	1½	1	2	3	1	3	0

From the above it will be seen that, while Mr. Field estimated spending no more than 1*s.* 9*d.* on unemployed benefit, I propose 14*s.* 4*d.*, and the N. U. S. A. actually spent 12*s.* per head of membership in 1895 on unemployed and sick benefit. What, then, is Mr. Field to do with his surplus? It is, as we see, in agreement with his definition of trade unionism, to be spent on legal and trade protection. No less a sum than 7*s.* 10½*d.* out of every 1*l.* 0*s.* 1½d. received is to go in strikes, reform, agitation, and the law courts. The secretary of a union that spent 1*s.* 9*d.* per head in law would need to live within speaking distance of the police and county courts. Neither the N. U. S. A. nor myself advise spending this large sum in that manner. To me it appears that the unemployed and sick man is the weak part of the defences, and that in supporting him we put ourselves in the strongest position for obtaining legal redress, trade protection, and parliamentary reform. To take 1*l.* from a worker and return but 1*s.* 9*d.* in direct benefit is not my idea of trade unionism, nor is it a proposal likely to appeal strongly to workmen even though they receive full value for the 7*s.* 10½*d.* expended in legal and trade protection. The engineers' union is reckoned the model of all unions, and, according to Mr. John Burns, 'had spent ninety-five per cent. of its income, not on strikes, but in ministering to the sick, and which in fifty years had spent 4,500,000*l.* in unemployed benefit and the like.' This example of the engineers I consider the right one to follow, instead of Mr. Field's proposal of fifty per cent. on legal and trade protection, which, in practical politics, means strikes, lock-outs, and like warfare.

Having pointed out this difference in the root notion of trade unionism, and the opposed methods of spending the subscriptions, it is manifest that something has gone wrong with the 'remarkable continuity' and 'identity under its various phases' that Mr. Field is so anxious to demonstrate, to what useful purpose it passes the wit of man to discover. What unionism he advocated in 1890 is not material to the unionism required in 1897.

Mr. Field is also at some pains to show that my unionism is not based on 'anti-force methods exclusively,' because I advocate using the law courts and Parliament for the redress of grievances. 'Law is force,' says he, dogmatically, and from this notoriously ambiguous premiss proceeds to draw some crude deductions concerning legislation, moral suasion, and force. Into these ethical propositions I shall not enter; the common sense of mankind does not look upon legal and parliamentary action as force, whatever may be the intense opinion of the school of philosophy to which Mr. Field belongs. Photographic assistants, obtaining redress by legal or parliamentary aid, need be in no fear of the Riot Act, nor will the Horse Guards be called out to suppress them as advocates of force. On the other hand, the phrase, 'trade protection,' has an ominous ring, and may imply a good many ugly things.

My critic also refers to the 'interesting anecdotes and stories of injustice' quoted in the *Photographic Worker*, dismissing them as trivial and beneath his notice. He also advocated, in the JOURNAL of July 25, 1890, a crusade against 'rabbit-hutch, cut-throats, and sweaters, purloiners, and detainers of specimens, and fraudulent apprentice-hunters,' though producing no proof to justify this strong language. It was therefore open to any one to get up and deny the existence of the evils. My anecdotes, &c., may seem trivial to Mr. Field, but in a hard and sceptical world they make just the difference between unsupported charges and definite statements capable of proof.

In concluding his article, Mr. Field mentions various gentlemen, amongst others Captain Abney, Professor Bolas, H. Snowden Ward, R. Barrett, as supporters of, or sympathisers with, his attempt to found a union. Against the good intentions of these gentlemen I have nothing to say, but would point out that a trade union is an organization established by workers for the advantage of workers. The foundation principles of trade unionism are common interest and self-help. Photographic assistants should clearly recognise that in joining a trade union they must be prepared to work out their own salvation. An individual, however great his ability, can do little unless he has a compact body of men behind him. To rely on big names is to lean on a broken reed. Whatever injustice photographic assistants suffer under, they will in the end be compelled to remove it themselves, an organization like the National Union of Shop Assistants supplying them, not with the motive power, but with the mechanism of action.

PHOTOGRAPHERS AND THEIR CLIENTS.

By THOS. FALL.

ALL photographers have their methods in dealing with their clients, and, no doubt, very various. Like a true fisherman, if one bait doesn't answer, I try another; you have to study your fish and its surroundings, and act accordingly. I gave an estimate to two ladies on one occasion to copy two *carte-de-visite* heads on china, to go in special cases; the amount stipulated was 8*l.* 8*s.*, with a proviso that, if the cases cost me more than I reckoned for, I should charge more; this was so, and I made an extra charge.

A few days after delivery I had a letter from a colonel in the War Office, written on official paper, to the effect that I had exceeded the estimate given, and that, as he had a witness to prove this, he would defend any action I might care to take; but he had the cheque for the amount he held was right, and would send it if I would forward a corrected statement.

Here was an opportunity for tact; my reply was, that the extra charge was in consequence of the cost of the special cases being in excess of ordinary ones; but, as I was a busy man, I had no time to fight the matter, or keep up an angry correspondence, and I would thank him to return the cheque to the lady, and, as far as I was concerned, the transaction was at an end. Within a week my friend the colonel replied:—

Dear Sir,—Since writing you, I have seen the two portraits and cases, and think them well worth the money charged, and have pleasure in enclosing cheque in full.—I am, &c.

This did not terminate the business, as the colonel called in person and gave me a good order for similar work, only for more money, and sat himself for a cabinet head, which I also put on china.

I can fancy, Mr. Editor, you saying, 'All's well that ends well.'

THE NEW SILVER LANTERN SCREEN.

By John Anderton.

The impetus given by photography to the optical lantern was pronounced, vigorous, and powerful. Upon the other hand, the lantern forcibly reacted, and, by offering to the photographer the means of displaying his pictures upon a large and impressive scale, enticed many to take up the practice of the fascinating science, who otherwise would have remained upon the daylight side of the developing-room door. Improvements were, as a natural consequence, made in the lantern. It was rendered more efficient, less bulky, and less expensive. Much thought, ingenuity, and skill were lavished upon the improvement of all applicable illuminants, including the homely oil lamp. For the latter much was done, and this useful, handy radiant became the friend of many, who, while admitting its usefulness, deplored its limited illuminating capacity, for between it at its very best and a limelight there stretched a vast track of no-light land with no half-way house upon it.

The screen, in common with the light, lenses, &c., received earnest attention, and at length the best portable screen was believed to be the opaque one, faced with distemper. No further advance seemed possible in that direction, and practical lanternists appeared to have unanimously concluded that a dead halt had been called, and that to look for improvement in that direction was a decidedly fruitless and hopeless occupation.

In making experiments some years ago with the object of finding a material that would reflect as received a polarised picture, and so make possible a practical lantern stereoscope, I found that, of the numerous substances experimented upon, one only (metals excepted) was of

the honest nature desired; in other words, all, with the exceptions given, upon receiving a polarised picture, at once, with an interfering spirit of a most annoying description, supplied what they deemed wanting, and, as a consequence, transformed the picture composed of polarised light into one the rays of which were of ordinary, every-day kind. The one material that answered to the demand to mind its own business and refrain from interference was impracticable for screen purposes owing to its greediness in the matter of light absorption, and its possession of other defects of different character that were equally objectionable, and I had therefore to fall back upon the metals, and silver, as the whitest, received first attention. A screen was made, faced with that metal in the form of leaf, and this answered the purpose for which it was constructed. That point being definitely disposed of, I proceeded to compare it with an ordinary screen for the purpose of testing their comparative powers of reflection, and found that the new screen gave astonishing results in the matter of brilliancy, and completely dwarfed all its rivals in this desirable particular.

The silver screen, although greatly superior in reflective power to the hitherto best, had two objectionable failings, viz., its surface was not uniform in colour and tone, and its inability to laterally reflect light was unpleasantly apparent. The latter failing was disagreeably conspicuous when the observer was anywhere but pretty directly in front of screen, for, in any other position, the side of the picture farther from the observer became dark.

Mr. Lewis Wright, the well-known authority on optical projection, experimented with a silver screen, with a view of testing how far its illuminating superiority held when used with a lantern microscope. Its value and reach above all others were obvious to that gentleman, as were the evils already mentioned, which stood formidably forth as barriers to its practical usefulness. To lessen or remove them innumerable experiments were made. White metals in the form of powders were applied by different methods and in different ways, and, although they answered to the call, and gave lateral reflection, they were also prodigal in impartially scattering light in all other directions, and, as a consequence, little in comparison was reflected where it was most needed. Mr. Lewis Wright suggested that the silver leaf should be covered by perpendicular striations, and then the width, depth, and form of the striations best for the purpose were anxious questions that could only be settled by direct experiments. After many of these had been made, each being accompanied by its own special failure, a striation was obtained, which gave of its best freely, and, with a charming sense of justice, gave a lateral and direct reflection that were practically equal within all needful limits, the result being a portable lantern screen that gives a picture of at least double the brilliancy of any other, whatever illuminant is used. Here, then, a successful attempt has been made to advance the oil lamp and Welsbach gas burner some distance upon the no-light land that hitherto lay between them and the far-away position occupied by the lime light. The power of the last-named and that of the electric arc are, of course, increased in a similar proportion, and lantern operators have the means at command of projecting larger pictures than formerly without decrease of brilliancy, or of obtaining the same illumination as formerly with a much less expenditure of gases or electricity.

ENLARGEMENTS FOR HOME DECORATIVE PURPOSES.

By William Fleming.

The possessor of a quarter-plate camera often longs for an enlarged print of some particularly choice negative, and many amateurs now have settled this difficulty by mastering the technicalities of enlarging and producing their own enlargements. This leads to another question, how to utilise the enlargement after it is made. It is quite impossible in the most of cases to frame every print made, as, no matter how enthusiastic the photographer, the line must be drawn somewhere.

The following simple method of getting over the difficulty, and at the same time exhibiting work to the best advantage, may be found useful:—

Get a picture-frame maker to make up a frame of any desired style of moulding. For an 8 × 10 enlargement a good size would be one which would take in a mount measuring about 18 × 20 with a cut-out centre of 7½ × 9½. In place of having the usual backing board to the frame a slightly heavier board is preferably used and made sufficiently small to go into the rebate of the frame. To give a better finish to the backing board it may be covered with bookbinders' cloth. Four small movable turn catches are screwed to the back of the moulding for holding the backing board in position. When it is desired to use the frame, the catches are turned back, the backing board lifted out, and a roughly mounted enlargement placed behind the cut out mount. The backing board is then replaced, and the catches turned to hold same in place. If desired, an extra thickness of cardboard may be put between the enlargement and the backing board, to ensure close contact with the cut-out mount.

With this arrangement of frame, the enlargement may be changed daily, and a different picture will thus always meet the eyes of our friends when they honour us with their presence.

A very effective method of disposing of the frame is to place it on a small size of artist's easel, which may be stained a dark brown colour. If desired, the upper part of the easel may be draped with some suitable coloured fabric, which adds very much to the appearance of the finished article.

PHOTO-LECTURING.

By T. N. Armstrong.

That a good limelight lecture is still appreciated by a large section of the public is a fact that cannot be gainsaid. In proof of this statement, witness the enormous attendance that has nightly thronged the Royal Art Institute during the six weeks' run of the Glasgow and West of Scotland International Photographic Exhibition, and to which there is little doubt the great financial success of this Exhibition is due.

In arranging for this extended course of lectures, the Executive very wisely provided both limelight as well as electric light for the projection of the transparencies on the screen, and the choice of which lamp to use was left entirely in the hands of those gentlemen who were lecturing.

As to the merits of the two systems, opinions, of course, may differ. An analysis, however, of the lecturers who declined to use the electric light is very instructive, and so long as these gentlemen pin their faith, as at present, in preference for the limelight, the electric light will not become popular, at least in the West of Scotland.

That several of those who had their slides shown by electric light were sorry for discarding the limelight is also well known to those who are within the ken, and in one instance especially was it evident, where a very fine set of slides, that would have shown up well with the limelight, were indifferently seen by the aid of the electric lamp.

In the case of two of the lecturers, at least, a considerable amount of speculation was raised as to the manner in which they signalled the lanternist to change their views, the audience being entirely unaware, by any sign or signal, of the intention to change from one slide to another, and yet the lanternist always made the change at the exact moment. In one case no less than 125 slides were changed in an hour and ten minutes without the semblance of a signal being shown to disturb the even tenor of the speaker.

Seven years ago, the writer, in conjunction with Mr. More, the lanternist at the last as well as the present year's Exhibition, invented a silent system of signalling for a change of view by means of an electric wire and battery, and for a time this little arrangement was a veritable puzzle to all and sundry. After a time, however, the *modus operandi* became known, and inferior imitations of the system became as common as penny pies all over the country, the result being seen in the 'press-the-button' apparatus. The original system, however, was very much better than what is now commonly in use, for the loud burning noise, so distracting to many in an audience, was entirely absent in this invention, a small arm, rising or falling like a railway signal, and which was confined in a small box that was detachable from the lamp, being the method originally invented, and used by myself and Mr. More, and so silently did this little arm rise and fall that no one six feet from the lamp could detect its movement.

The secret, however, was out, and, like all other good things, was copied and spoiled by the introduction of a method that is as noisy as the flight of a covey of partridges among the audience.

That very much of the success of an entertainment such as I am considering is due to the lanternist goes without saying, and, no doubt, very much of the credit is due to Mr. More for the admirable system shown at a recent lecture in Glasgow, where the audience and a host of knowing ones were entirely puzzled to find out how the lanternist knew when to change. Electricity had nothing to do with it this time, and yet how simple when one knows the secret.

CRACKED OR BROKEN NEGATIVES.

By Alfred I. Taylor.

There are various ways of treating broken negatives so as to prevent the crack mark showing to any great extent in the print. If the crack is not in a very prominent part of the picture, the easiest way is to back the negative with a piece of glass, binding it down round the edges. This

will prevent the film getting broken. Should the negative be broken in several pieces, these may be cemented on to another piece of glass with Canada balsam, taking care that a little of the balsam gets between the edges of the pieces. Any balsam on the face of the negative may be easily removed with a tuft of cotton-wool moistened with benzole. When printing, the frames should be turned partly around every few minutes, or they may be printed at the bottom of a box.

When the glass only is cracked, the negative film may be stripped off, and placed on another support, either of glass or celluloid, which, to ensure the film adhering, ought to be coated with a solution of gelatine, to which has been added a little alum. Some plates require only to be soaked in water for a few minutes, when the film can be removed by lightly rubbing with the finger, commencing at one corner; with others, the film will refuse to move unless an acid bath be used. Great care must be taken in laying the film on the support not to get the lines out of the perpendicular.

ACETYLENE IN PHOTO-MICROGRAPHY.

By W. H. Walmsley.

The fortunate workers in photo-micrography, to whom direct sunlight, oxyhydrogen, or the electric arc are available, will probably pass this article by unread. Either of these lights is so efficient and satisfactory for this work, that they are, doubtless, satisfied with the one they habitually use, and feel neither inclination nor necessity for making any change. But the vast majority are quite differently circumstanced. To them the best—in fact, only—illuminant is that of the coal-oil or paraffin lamp, very useful and practical, but with so many deficiencies as to cause a constant longing for something better. Hitherto this has seemed unattainable, but the brilliant and highly actinic light of acetylene places within the reach of every one the ideal illumination for photo-micrography. The Welsbach incandescent gaslight was, it is true, a great step in advance of the oil lamp, but is so far inferior to that of acetylene as to leave it quite out of sight in comparison therewith.

During the past two years I have used acetylene exclusively for this work, with uniform success and satisfaction. The gas is furnished by a small portable generator, capable of supplying two burners, each of one foot capacity, for a period of ten hours. In practice, however, I use but one burner, ranging in size from one-eighth to one foot, as may be desirable, the most satisfactory all-round size being a one-half foot. The light is absolutely steady and *uniform*, with so high a degree of actinism, as to render shutter exposures necessary for many objects. with power up to one-half or four-tenths of an inch. The uniformity of the light is one of its most valuable features, as it never varies with any size of burner. *Semper idem*, leaving no room for guess-work as to length of exposures, it not only reduces these to a minimum, but insures a certainty of results unattainable by any other light I have ever worked with. The flame emits no perceptible heat or deleterious products of combustion, so that one may work a long time with it in a small room without experiencing any unpleasant effect. The generator can be manipulated

by any one quite as readily as a lamp, and the cost of maintenance is too trifling to require consideration.

Never having used either the electric arc or oxyhydrogen light in my own work, it is impossible for me to present any data of their values as illuminants in comparison with others familiar to me. But the following table, compiled from the results of many hundreds of exposures, may be relied upon, I think, as approximately correct in its comparative values of the sources of light named. Supposing the correct exposure with a given objective, and object illuminated by direct sunlight from a heliostat, to be one second, we have :—

Direct sunlight	1	second.
Acetylene, one-foot burner	3	seconds.
Diffused daylight, from mirror	12	,,
Welsbach incandescent gaslight	24	,,
Coal-oil or paraffin lamp	240	,,

as about the required exposures to produce negatives of similar qualities in detail, density, &c. It would seem superfluous to say more regarding the pre-eminent value of acetylene in photo-micrography for making the negative.

Scarcely less valuable, however, is this remarkable light in another department of photo-micrography, that of printing, especially valuable to those whose work is mainly done at night. It is altogether too brilliant for use with the ordinary bromide papers, but a paper introduced during the past year under the name of Velox is not only exactly right as to sensitiveness, but produces the best prints of any that have ever come under my notice. It is a bromide of so slow an emulsion that it may be safely manipulated by ordinary lamp or gaslight, or in subdued daylight, but which, exposed behind a negative to a one-foot acetylene burner, at a distance of six or eight inches, will print in three to ten *seconds*, according to density of the negative. It may be developed with metol, amidol, ferrous oxalate, &c., in the full light of a lamp or gas flame, producing a print of the utmost brilliancy and permanence. It is furnished in both matt and glossy surfaces, the latter being preferable for photo-micrographs.

INDIAN WANTS.

By H. Manners.

P.O.P. and bromide papers are sent out by manufacturers conveniently cut up into sizes, which results in a very great saving of time and trouble. Why is not ready-sensitised albumenised paper done up in the same way? There are many photographers who still prefer the old silver print—I for one—and there would be a ready sale if this paper were sent out in cut sizes, especially among amateurs. No paper can yet beat albumen for simplicity of working, certainty, and variety of tone. Both plates and papers deteriorate very quickly in this country, in fact anywhere throughout the tropics, and ordinary consumers can never

depend on getting these fresh; the ordinary dealers take no special care of their stock, which consequently suffers from the heat and damp. What is wanted is that each packet of plates or paper should be plainly stamped on the outside with the date of its leaving the works of the maker. I wrote on this point to a dry-plate firm some time ago. They replied that every batch was marked with a distinctive number. That is so; but this number gives no information to the consumer, who is often sent packets of paper and plates which have been lying on the shelves of a dealer for a year or so. The results with these are naturally unsatisfactory, and the cause of much annoyance and disappointment to the user, not to mention the 'cusses' when he finds his negatives develop out with spots and dead patches. I personally have suffered greatly from this cause. A good fresh plate, in careful hands, will always yield a good negative, and fresh paper a good print; old and dead plates and paper will not, and the simple suggestion I have made would always enable a worker to know if the plates and paper he buys are reasonably fresh.

While on the subject of plates, can our clever chemists and scientists in photography not give us a plate (dry) that will develop with the old acid iron developer like the old wet plate? For dry plates developers are legion—good, bad, and indifferent. What we want is one like the old iron, that, with a suitable plate, will develop up quickly and clearly, and in which the progress can be plainly seen, as was the case with the wet plate. At present there is too much groping about at the bottom of a tray, and ever a delightful uncertainty. Surely science can help us in this matter; and I feel certain, were a reliable plate of the nature of the collodion wet plate put on the market, it would have an enormous sale.

Masks.—Why is it that there is so little variety in the sizes of the openings in these? In the quarter and half-plate sizes most of the ovals or other designs cut off far too much of the picture, especially in landscapes. What is wanted is designs only cutting off the margins of the plate where it rests in the rebate of the slide or sheath, say one-eighth or three-sixteenths, so as to leave in the print as much of the picture as possible. I have tried all over India to get masks only cutting off narrow margins, but without success, and I have had to cut them out myself, which is by no means easy to do cleanly and evenly. In the different art series of designs a great number of pretty designs might be added, say diamonds, stars, and different-shaped corners. Circles are often useful, but cannot be obtained except for lantern-slide masks; in fact, there are hundreds of designs that would greatly add to the turning out of pretty little snap-shot prints. The maker who will put on the market packets of, say, fifty designs, each design in threes, that is, with very narrow, medium, and wide margins, will soon find his sales increase. Discs are very rarely used.

Hand Cameras.—These are made in ever-increasing numbers yearly, but few makers go out of their way to meet the wants of photographers in tropical countries. The following are some of the wants. A good, simple hand camera, that will not swell in the damp weather or warp and crack in the heat. Is it not possible to make cameras of some material, like ebonite, which would stand the varying effects of different changes of climate such as we have out here? I had a hand camera that worked well all through the hot, dry season. I took it with me on a

sea trip during the monsoon, or rainy season, when the wood swelled up and plates jammed. The result was I did not get a single negative on my trip, which, I need hardly say, was a great disappointment, especially as I had taken with me a gross of quarter-plates, expecting to bring back a fine lot of good negatives. Talking of trips, let me advise all to develop their negatives as soon after exposure as possible, be they plates or films. In my experience those developed, say, within a day or so of exposure will generally yield nice bright negatives, whereas, if kept for a month or so before development, results in the negatives being flat and showing a want of brightness and crispness. Even on board ship development of small plates can easily be done in the cabin at night, with a small dark-room lamp, or two or three folds of Turkey red cloth round the electric-light globe will make a safe and pleasant light. Once the plates are developed they are all right, they can be stored away easily, and printed from at leisure with satisfactory results. If cameras must be made of wood, then they should be covered with some other material than the so-called morocco leather. Out here this covering seems to be greatly affected by damp; it gets all covered with mildew and discoloured, and it also rubs and peels off very easily. Some sort of waterproof covering should be made to supplant the leather. Another want for countries with very bright sunlight like India is an inner or safety shutter, between lens and plate, as well as the ordinary everset shutter in front or in slot. This safety shutter protects the sensitive plate from any pencil of light that may work in while the camera is being carried about, and can be pulled aside when a picture is about to be taken. Some cameras, the Facile, for instance, have this extra shutter, but in most of the hand cameras it is absent, and many are the plates spoiled by light creeping in through the lens and impinging on the plate. Another point is that every shutter made of metal should be of some metal that will neither rust, nor polish bright by the friction of its working. I know a brother photographer who last year got one of the most expensive hand cameras made. The shutter is of steel, and he has written me it is all rusted (I may say his work is chiefly at sea), and the result is that it constantly jambs; any attempt to clear away the rust only polishes the metal, and helps to let in light. This is a defect that camera-makers could easily remedy, but makers are very conservative. Their only idea seems to be that a camera suited for England is good for all parts of the world. The sooner this theory is put aside the better for all parties. Again, in most hand cameras it is almost impossible to get well and easily at both the lenses and shutters. Now, lenses out here, or on board ship, soon get covered with dust or fungus, and, if good work is to be done, need constant wiping. Makers generally advertise that lenses, &c., are getatable, but it is generally far from being the case. No doubt, by putting a bit of cloth on end of a penholder or bit of wood, the lens can be got at in some way; but this is not sufficient. What is wanted in all cameras is that the lens and shutter can be easily removed altogether, thoroughly cleaned, and replaced. A very slight arrangement would meet this want, and I draw makers' attention to it. Now, if I write any more, you will probably be more inclined to put it in your waste-paper basket than in the pages of your ALMANAC, so I will conclude with the hope that makers will note our wants, and meet them to the best of their ability.

THE TESTING OF LENSES.

By A. Kapteyn.

In a short notice, early in the year, in The British Journal of Photography, you referred to some lens-testing arrangements which I have made for my own convenience. As I have received several inquiries about these arrangements, it might be desirable to give a somewhat more extended description of these arrangements in the Almanac. Of late years, all lens makers have given special attention to flatness of field and freedom from astigmatism, and the results they have obtained in that direction may well be called wonderful. The perfection of these latter-day productions is such that one is inclined to the belief that little is left to be desired, although, of course, the future may have things for us in store more wonderful still. However that may be, feeling personally interested in the good qualities of the various splendid lenses on the market, I arranged, for my own use, an appropriate test object, consisting of a flat vertical wall, fairly well and pretty uniformly illuminated.

This test surface is a square, 8 feet by 8 feet, and is covered by diagrams, concentric circles, fine line scales, wood engravings, printed matter, &c., and these various prints are so distributed that the four squares into which the main square is divided contain fairly symmetrical images. Each of these squares is photographed on a separate portion of

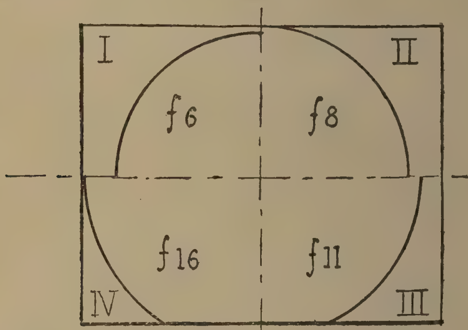


Fig 1.

the sensitive plate, and with a different stop, so as to have on one plate four different negatives relating to the same lens. This, of course, is a great convenience when examining the results.

When the test object is photographed, the image on the ground glass (if it be large enough) will give a certain size circle of illumination; and as the lens is of symmetrical construction with respect to its optical axis, a quarter of that circle will be as good as the whole of it for judging the covering power and other qualities of the lens.

It will thus become clear that if we expose the squares I., II., III.,

IV., of the plate separately, and with different stops, a pretty complete history of the lens will be obtained, and the influence of the stop used, and the corresponding covering power of the lens, can be studied with great ease.

The simplest way to expose the plate in four sections is to take a piece of blackened thin board, as shown in fig. 2, which exactly fits the frame against which the ground glass of the camera is hinged, leaving only a quarter, I., of the ground glass visible, and, if the plate is exposed, only that square I. will be impressed. By turning the wood round from

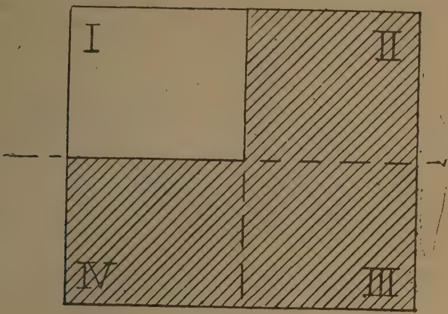


Fig 2.

right to left, square II. becomes visible. Then, by turning it upside down (top to bottom), square III., and finally, by turning it once more from right to left, square IV. will be exposed. If the camera has a reversing back, it is not neeessary to take the slide out between the various exposures. All one has to do is to shut the slide, detach the reversing back, and turn the piece of board the right way. The reversing back is replaced in position, the slide is drawn, another stop is inserted, and a fresh square is exposed.

To avoid confusion in judging several negatives and lenses, it is best to provide each square of the test screen with slips of paper, between which cards can be inserted, on which the name of the lens, its focal length, and the stop used, are inscribed with bold letters. In this way these particulars are photographed on to the plate, and the negative shows unmistakably to which lens and to which stop the square refers.

Now, as to the support of the camera, the two chief points to be remembered are:—1. That the sensitive plate must be accurately parallel to the test object, and perpendicular to the axis of the lens; 2. The optical axis of the lens must coincide with the line that joins the centre of the ground glass with the centre of the test screen.

To satisfy these two conditions with a camera on a tripod is practically out of the question, if time is a consideration. I therefore adopted the following arrangement. The test screen is a vertical end wall; the room is only nine feet wide and twenty feet long. The side walls of the

room are provided at the proper height with wooden rails, and these rails support a strong wooden bridge, of a T-square section, to give rigidity against flexion. It would be desirable to provide this bridge with four strong pinions, to run on racks placed on the wooden rails, to ensure parallelism of motion; but a good and cheap makeshift is to paste on the sides of both rails paper strips, with inches and their subdivisions, so that the front edge of this bridge can be placed at both ends equally distant from the test screen.

The bridge is now moved up to the test screen, and the camera so placed that the centre of the lens mount coincides with the centre of the test screen. It is necessary to ascertain with a level-square whether the front board of the camera is truly vertical. If not, the camera must be packed to make it so, and it is then firmly attached to the bridge by its centre screw and side stops. The next thing is to ascertain whether the ground glass is vertical, and the swing back may be used to make it so. Finally, it is important to see that the ground glass is parallel to the test screen, and for this purpose a long straight-edge may be used, and measurements taken to see whether its ends are equally distant from the test screen. A better plan, however, is to have a special straight-edge made with two legs accurately of the same length, and, by screwing the camera in or out, it can be seen to a nicety whether the ground glass is parallel to the screen.

The bridge is now moved away from the screen to such a distance that the ground glass just takes in the whole of the test screen. In testing lenses it is desirable to take a considerably larger plate than the size for which the lens is listed, because the performance of the lens outside that field settles the question as to how much use can be made of the rising front, &c.

To make sure of perfect register between focussing screen and plate, it is best to use only one side of the same dark slide, to remove the partitions in the slide, and to place the focussing screen in the very same place in which the plate is going to be exposed.

CELLULOID FILMS AND THE LATENT IMAGE.

By R. P. Drage.

In a former contribution to the Almanac respecting the destruction of the latent image in the case of celluloid films (cut sheets) which had not been developed for some considerable time after exposure, I pointed out that the emulsion itself had not appeared to have suffered in any way.

During the Jubilee festivities I was enabled to expose twenty-four films at the Naval Review, and a few days after, at the Review at Aldershot, I exposed about twelve dry plates. I placed them altogether, the films being laid on the top of the plates, in an ordinary cardboard plate box, without separate wrappings; round the outside of the box three coverings of brown paper were placed and tied round.

Work for the Great Yarmouth Convention prevented me for a considerable time from developing these exposures; but, when I came to operate with them, I found that neither on the films nor the dry plates could I get but only a trace of the expected image.

Talking over the matter with a well-known chemist and dry-plate maker, he informed me that the nitric acid employed in the manufacture of the celluloid would undoubtedly tend to completely destroy any latent image after a certain time had elapsed since exposure, so that in the above case the destruction of the latent image had been going on, in *both films and plates*, owing to the presence of the acid, ever since their exposure in the camera, the emulsion itself on both films and plates seeming to keep thoroughly good.

Of course, a plate always seems a little more convenient for development than a film, but, given the same emulsion on films as on plates (and we certainly are favoured in these days with most magnificent material by our plate-makers, even to the issue of ready-backed plates), the trials of travellers and tourists are considerably reduced, twelve dozen films weighing very little more than one dozen glass plates, besides the immunity from breakage. At the same time, if we could only persuade the makers to dispense with the use of that destructive acid in the manufacture of the celluloid, another trouble would be removed, as, in my opinion, with the present mode of manufacture of the celluloid, a fortnight at the outside should only elapse after exposure to get good results when developing cut films.

My remarks do not in any way apply to the rollable film, the manufacture of which is totally different, but to the films as they are sold in packets of cut sizes for use in our dark slides and changing boxes in the same way as dry plates, and the use of which is increasing to an enormous extent with tourists and travellers who are also photographers.

A RETROSPECT.

By E. W. Foxlee.

The historical photographic Exhibition, held at the Crystal Palace during the past summer, served as an admirable object-lesson to illustrate the progress of photography during the fifty-eight years of its existence, from 1839. It served also as an object-lesson to show how little advancement, so far as actual inventions and results are concerned, has been made during the latter half of that period as compared with what was done in the first half of it. Some modern workers seem to be under the impression that nothing really good was done prior to the introduction of gelatine photography, or, as it is generally expressed, 'dry plates;' but the things shown at the Crystal Palace ought to have quite dispelled that idea.

As to dry plates, there were several processes by which they were made that yielded results quite equal, if not even superior, to those on gelatine plates. It must be admitted, however, they were not so sensitive. For example, there were in the Exhibition some albumen negatives, as well as transparencies from them, taken in the early 'fifties,' that I unhesitatingly say cannot be equalled, for fineness of detail and general excellence, by any gelatine plates. There were examples of dry-collodion plates; one frame of 12 × 10 prints from negatives made in 1854–5, which will hold their own against any modern negatives of the same well-known subjects—views on the Thames. Some pictures by the collodio-

albumen process, and by the gum-gallic process, taken by an amateur in the 'sixties,' cannot be beaten by gelatine.

As a rule, larger sizes were worked by amateurs in the early days than is the case now. There were in the Exhibition examples by an amateur of 24×18 pictures, taken direct in the field, on dry plates (collodio-bromide) of his own preparation thirty years ago, that it would be impossible to beat now on gelatine plates. The prints were made at about the time the negatives were taken on albumen paper, and they showed no sign of fading. Examples there were of paper negatives, and prints from them, that were taken in the 'forties' and 'fifties,' that were quite as good as modern paper negatives. A series of the interior of the '51' Exhibition—there is no doubt as to the date of them—are as free, if not freer, from granularity than those on modern gelatine paper negatives. At the time these pictures were taken there were no anastigmat, or even rectilinear lenses, yet some Daguerreotypes of the interior of that building show no distortion, or curvature, of the columns at the margins of the pictures.

As to instantaneous photography, there was a Daguerreotype of New York Harbour, taken in the early 'fifties,' that was in every way as sharp as if it had been taken on a modern gelatine plate. Instantaneous street scenes—London and Paris—published some thirty years ago, taken by the wet-collodion process were equally as sharp as any taken since on gelatine plates.

Take again the carbon process. There were some pictures by that process exhibited, which were made more than thirty years ago, the excellence of which could not be surpassed at the present time. Another permanent process—platinum—we have had nearly a quarter of a century. Film photography again, rollable film, and roller slides for using them, were made, commercially, quite in the early 'seventies,' and results upon them, equal to those on present-day films, were shown in the Crystal Palace shows. Thirty and more years ago enlargements were made, commercially, direct from the negative on silver paper—'iodised paper'—both by electric and by limelight, and they were equal, if not superior, to most now done on gelatine paper.

In the matter of permanence in silver printing have we advanced, or have we not rather retrograded? At present some consider that if a print lasts for four or five years—and many don't—that is all that can be expected; but in the Exhibition there was a silver print made in 1839, and several others, on plain paper, made in the 'forties,' that were quite unchanged. So were some albumen prints forty or more years old. The collodio-chloride process, which is being more used now than hitherto, dates from 1865, and some pictures were exhibited that were made by it twenty-six years ago, which showed no sign of deterioration. By the way, these were on paper 'made in Germany,' as until recently that country was the only source of supply of the paper. Examples of the 'blue process,' now so much used by architects and others, were in the Exhibition, that were produced some forty years ago, that had undergone no change.

As regards the photo-mechanical processes, they have advanced *very* greatly during the last few years; yet, in the Exhibition, there were examples of 'process' block prints, photogravure, as well as photo-lithos in half-tone (1859–60), which would compare very favourably with *some*

of the commercial work that is turned out now. The collotype process is nearly thirty years old, and some of the work done by it more than a quarter of a century ago is certainly superior to much that is produced now. Ceramic photography is very old, and an example shown, dated 1862, was quite equal to any modern work.

Although photography has made great progress during the last quarter of a century, it is difficult to see what is done now that was not accomplished prior to that period. It was done, it is true, under greater difficulties than exist now, but still it was done, and done well too. The principal advancement in photography during the past five-and-twenty years seems to be more in the direction of increased applications and greater facilities in working—thus lightening the burden of the worker—rather than in new inventions or general superiority of results.

A HELP IN THE STUDIO.

By Henry Erle Cooper.

Although for many years past lens-makers have been aware of the advantages of shielding the lens from all unnecessary light, and photographers themselves have had some knowledge of the benefits resulting from so doing, it is extremely doubtful whether this knowledge has been applied to the extent it ought to have been.

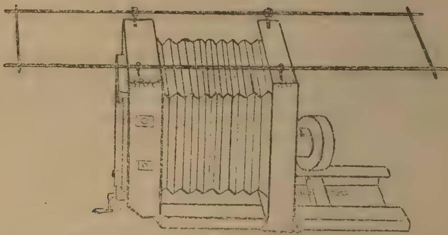
It is a fact, well known to artists and others, that, by shutting out all unused light from a picture or scene, the brilliancy of that object is materially increased. Thus it is that, when the most striking effect is desired on a certain painting or view, the best result is obtained by looking through a tunnel arrangement, the effect of which is to increase the brilliancy until a picture sometimes appears almost stereoscopic.

What I have said regarding the viewing of pictures and scenes applies equally to photographing the same, and it is somewhat surprising that the importance of the subject has not been observed before.

Lens-makers, I know, practically all manufacture their lenses with projecting hoods on the front, and, although it is an undoubted advantage, it still leaves room for considerably more improvement in the same direction. Sometimes a cone or tube of either tin or cardboard is attached to the front of the lens with a view to shut out rays of side light. Such a plan, whilst, no doubt, effective, is both unsightly and obtrusive, and is in no way equal to the arrangement which I am about to advocate—an arrangement which effectually shuts out all side light from striking into the lens, keeps the camera and lens protected from dust and injury, covers the dark slide from light, and allows the operator to focus in comfort and with ease.

A framework is first made of brass tubing, or rods about three-eighths of an inch in diameter; the length should be between three and four feet, while the width will be decided by the measurement across the top of the camera, the two end or cross pieces can, if desired, be made of mahogany, which can be fitted more easily. The framework is now secured on to the top of the camera by four brass or steel screw eyes, the holes of which are slightly larger in diameter than the brass rods;

these eyes are screwed, one at each corner, the proper width apart on the top of the camera, so that the framework travels backwards and forwards through the eyes easily and smoothly, which it should do if properly made. The focussing cloth, which should be of ample dimensions, is placed on it, extending from the front and hanging over the back so as



to shield the screen. When about to use the camera, the framework is drawn back, and allows the focussing to be done in ease and comfort. When ready to expose, it should be pushed forward its entire length, and thus forms a most excellent shield to the lens.

The photographer who has never tried the effect of shielding his lens will probably be surprised by the increased brilliancy that he gains by so doing; whilst, if he adopts the arrangement I have advocated, he will find that it adds materially, not only to the result, but also to the ease and comfort of studio working.

Although there may be no novelty in the above—which I have seen worked in other studios besides our own—I believe it to be a matter much neglected by many professionals.

CATALOGUING AN EXHIBITION.

By R. Child Bayley.

Photographic exhibitions are so common nowadays that the Secretary of a Society may almost at any time find himself engaged in organizing one, and, if he has no experience to fall back upon, will probably do many things in a roundabout manner which, with the knowledge gained by having gone through the same performance before, would be done as well with perhaps half the trouble. Making the catalogue is a case in point.

There are two ways of issuing a catalogue. In one each exhibitor's work is listed together, irrespective of the position of the various frames on the wall. From the Secretary's point of view, this is the simpler; from the visitor's, the more exasperating, since the latter wanders round and round the Exhibition to find No. 13 (Mr. Smith's portrait of himself) or No. 272 (A Study, by Miss Brown), without the clue yielded by the regular sequence of the numbers on the frames. No. 13 may be between No. 2 and No. 200, while Nos. 1, 2, 3, and 4 may be on four different

walls. This is how it should not be done then, and need not be further discussed.

The better plan is to have the numbers on the frames running consecutively through the Exhibition, so that No. 2 is next No. 1, No. 3 next No. 2, and so on. The reason why this system is sometimes shirked is to be found in the belief that, in consequence of the catalogue order depending upon the hanging, the actual work on the catalogue cannot be commenced before the hanging is over. This is not the case in practice, if the method adopted at the Royal Photographic Society's Exhibitions and, doubtless, at many others, be adopted.

On each entry form are two columns, headed, 'For office use.' One would think this heading would be understood by every exhibitor as not referring in any way to him, and yet the writer has had would-be exhibitors writing to inquire how those columns should be filled up. This, however, is by the way. Each frame, as it is received or unpacked, is given a number, its office number, which number is filled in in the first column of the entry form of the particular frame numbered, and serves to describe the print until the hanging is over. An adhesive number label is stuck on the glass to correspond, and the paper on which such number is printed should be distinctive in colour from that of the label finally employed.

Sheets of foolscap are ruled as below beforehand :—

	Office No.	Catalogue No.	Catalogue No.	Title.	Exhibitor.
	1 2 3				
A	B	C	D	E	F

As soon as the preliminary numbering is done, the entering up on these sheets may begin. A is used simply to join the sheets together into a book form. The office numbers are already filled in consecutively in column B, and the title and exhibitor's name is written out in columns E and F. Nothing more need be done until the hanging is over, when the prints are numbered consecutively as they hang on the walls, whoever does so making out a list of the office numbers and putting against each its final or catalogue number. The catalogue numbers are then entered up, off these lists, into columns C and D, twice over, it will be noticed. When this has been done, the foolscap sheets are cut through between columns C and D, as shown by the double lines, and then, with a sharp knife and a straight-edge, the sheets are cut up in the other direction into a series of slips, each bearing the catalogue number, title, and exhibitor's name of one frame. These are sorted out into numerical order, stuck on to sheets in that order, and form the copy, which can be sent straight away to the printers. The columns A, B, and C, which are not so divided, form a kind of reference book, which will enable the original or office number of any

frame to be easily ascertained. From this the entry forms, which have been kept in the order of the office numbers, may have their second column filled in with the catalogue numbers. The forms are then arranged in the alphabetical order of the exhibitor's names, and the compiling of an alphabetical list of exhibitors, each with the number of their exhibits attached, becomes very simple.

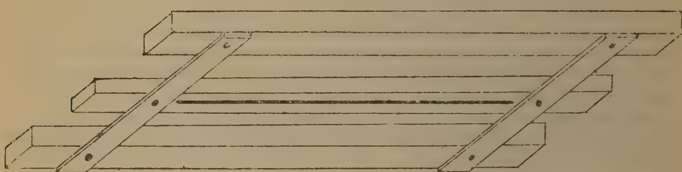
By acting in this way, it is quite easy to have the copy for a catalogue of 300 or 400 exhibits ready for the printers in an hour or two after the hanging is completed. Mistakes do not often occur, there is no need to look on the back of the frames for the exhibitor's name or the title of the exhibit, and the loose hanging label, never very satisfactory, is done away with. The system is simpler in practice than it appears on paper, and will be found a labour-saving device at a time when to most Hon. Secretaries such is most valuable.

This slip system is very useful in other ways. In cataloguing libraries it is convenient, and in making indexes and alphabetical lists of members it will save much time. If 100 names are wanted arranged in alphabetical order, it will be found quicker to write them out roughly on slips, cut them up, and arrange them in the required order, and then to fair-copy them out, than to attempt to pick them out one at a time in drawing up the list. In such a case as I have mentioned, the saving of time alone amounts to something like fifty per cent., and the liability to error is also much reduced.

HANDY PLATE-CUTTING APPLIANCE.

By W. P. Wiseman.

Now that there are so many small cameras in the market, taking the halves or quarters of standard sizes, a simple appliance for cutting up plates may prove of interest. In a general way, only a very few brands can be obtained ready cut to these small sizes, and the chances are that our own pet plate is not among them. A fixed guide, arranged to cut



to a definite size, has one disadvantage, if the plate being operated upon is not of the full standard size, whatever error there may be is all cast on one half. Thus, if we are dividing a half-plate longitudinally with a fixed guide set to cut two and three-eight inches, if the plate happens to be only, say, four and five-eighth inches wide, we shall have the one side two and three-eighths and the other only two and a quarter inches wide. This may possibly mean that our little plate will drop through

the carrier, for the rebates cannot well be very wide in these small sizes. If we could divide our plate *exactly in half*, whatever its size, this risk is reduced to a minimum. This object is attained by the use of the following appliance: First construct a magnified parallel rule of the ordinary mathematical-instrument pattern, *i.e.*, two flat rulers connected by a couple of crossbars; exactly midway in these crossbars drill a hole and pivot thereto a third ruler, somewhat less in thickness than the other two, so that, when they are resting on a flat surface, it may be raised about one-sixteenth of an inch. This third limb is slotted, almost from end to end, exactly in line with the pivots, the slot being of such size as to allow a diamond or wheel-cutter to slide along easily, but without side shake. If the affair has been carefully made, we may place a plate, of any size within its capacity, between the outside rulers, and, when they have been closed to grip it closely, the glass-cutter, on being drawn down the slot, will divide the plate exactly.

The rough sketch accompanying explains the principle. One of the rulers may be fixed, and in many respects is preferably so. The central limb is most readily made by being built up as it were, the plan of one end appearing thus :—

the black part being the slot. I have given no dimensions, as they wil depend on the largest size of plate intended to be cut. For cutting up to half-plate, a suitable size would be about eighteen inches long for the rulers and nine inches for the cross-bars.

ON THE PERMANENCE OF VARNISHED NEGATIVES.

By Matthew Wilson.

The recent examination of a series of dry-plate negatives, taken by myself about fifteen or sixteen years ago, has led me to form somewhat unfavourable conclusions as to the action of photographic varnish upon a gelatine film.

Of the plates in question about one-half had been varnished, these being chiefly portrait negatives from which a large number of prints were required. The unvarnished remainder, consisting mainly of half-plate landscapes, had been treated, in regard to development, fixing, and washing, in precisely the same way as their varnished companions; and it is well that I should add that, except in two or three cases, one brand of plate had been adhered to from first to last.

Subsequently, silver prints of the entire series were repeatedly taken on albumenised and other papers, quite as many being printed off of the members of the landscape or unvarnished group as of the portrait or varnished.

It only remains to be added that the varnish that I employed was

prepared by a well-known firm of photographic chemists. It was one specially intended for dry-plate negatives, and I found it to be pure and of excellent quality.

I mention the various preliminaries thus in detail, because they serve to throw light upon effects the causes of which it might otherwise be difficult exactly to trace.

These effects, which are confined solely to the negatives that received the varnish coating, consist of a general darkening or increase in density of the image. In some cases this defect is noticeable only by a yellowish tint, so pale as scarcely to impair the brilliancy of the high lights; in others it is so pronounced as to amount to absolute opacity. It is generally most marked about the centre of the negative, but it is seldom that it makes its appearance, either there or elsewhere, without imparting a proportionate increase in density to the image taken as a whole.

This phenomenon is to be attributed to a combination of circumstances, partly physical and partly chemical. Practically the operative causes are two in number—firstly, imperfect washing; and, secondly, the employment of varnish. In addition to these, theory recognises the existence of a third cause, and that a very important one, namely, the porosity of the gelatine film. I will take the last-named first, in order to make my meaning clearer.

If we take an imperfectly washed negative after drying, and examine the surface of the film through a magnifying glass, we shall find it coated with a thin white layer of very minute thiosulphate crystals. These crystals have been expelled from the pores of the gelatine during the process of drying. In some cases the deposit is visible to the naked eye; in others, even the lens will hardly reveal its presence.

Reasoning by analogy, we shall be justified in concluding that the expulsive function of the colloid body will maintain itself under the various conditions of washing which we can produce, and we shall accordingly expect that whatever portion of saline residue a film may retain after washing will ultimately find its way, either to the pores in the immediate neighbourhood of the surface, or to the surface itself. This porosity of the film has, we see, then, a powerful influence in maintaining the stability of the image against the attacks of the destructive agencies attendant on perfunctory washing, an influence of no small moment to the photographer, seeing that, so far as dry plates are concerned, perfunctory washing is one of the crying evils of the day.

Now, bearing in mind the facts that have just been stated, it is easy to see that the application of varnish to a dry-plate negative (save in the few cases where it is possible to establish the certainty of the elimination of the thiosulphate), though a thing legitimate enough in itself, is none the less likely to endanger the permanence of the image, for we must not forget that, just as the film was porous to the thiosulphate solution, so will it be to the varnish, the only difference being that, in the former case, the action was outwards towards the surface, whilst in the latter it is from the surface inwards.

Now, in actual practice, what seems to happen is this, the warm varnish, in permeating the the film, carries down with it into the body of the image the crystalline deposit which has formed on the surface of the plate during the process of drying. It is now, so to speak, locked into

the film and under the new conditions thus brought about the silver of the image is partly converted into sulphide, &c., and the result is the gradual destruction of the negative.

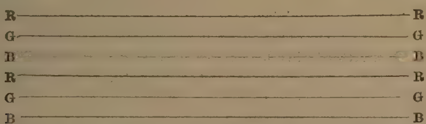
Two remedies suggest themselves for this state of things. The first is to varnish no plate that has not received a washing sufficient to destroy all traces of sulphur salts. The second, which personally I am inclined to prefer, is to wash well, dry, and print without varnishing at all. With ordinary care there is absolutely no need for a varnish coating in the case of the average dry plate, even although many prints should be required from the negative. In this matter, however, as in many others, we must expect to find differences of opinion. What is of real moment is that the photographer should always bear in mind that, in every case in which varnish is to be applied, the washing of the plate must be of the most thorough character.

McDONOUGH (JOLY) PROCESS OF COLOUR PHOTOGRAPHY.

By Milton B. Punnett.

This article has been written, not with the intention of discussing the respective claims of the late Mr. James McDonough, of Chicago, and Dr. Joly, of Dublin, as to whom belongs the honour of discovery of this method of reproducing, or attempting to reproduce, the colours of nature by the aid of photography, but with the idea of giving a brief outline of the process, together with a short criticism of the same.

Through the kindness of the late Mr. McDonough, who was a genial whole-souled man, possessed of large inventive faculties, the writer had the pleasure of examining some beautiful specimens of his method. The screen used was a mica plate, ruled with alternate lines of red, green, and blue.



These lines were about one two-hundredth of an inch in width, and were in *intimate contact* with each other. The colours were not visibie to the naked eye, the screen appearing of a greyish tinge.

Under a powerful magnifying glass the bright coloured lines could be plainly seen.

This screen was mounted on a glass plate.

As a simple subject to photograph, let us take a red letter, 'R,' a green letter, 'G,' a blue letter, 'B,' a letter 'M,' whose colour is composed of a mixture of any two of the above colours—say, red and blue—and a white letter 'W,' which, of course, would contain the three colours mentioned above—

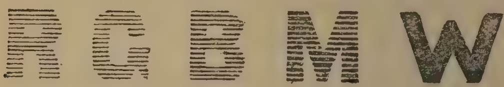
R, G, B, M, W.

As the best orthochromatic plates are much more sensitive to the blue-violet and ultra-violet than to the red, yellow, and green, an auxiliary

screen, to cut off the ultra-violet, which affects the plate and not the eye, and to reduce the blue and violet, will be necessary. This screen is not ruled, and is similar to those ordinarily used in orthochromatic photography, and, in this instance, will be placed between the lenses.

Our line screen is placed with the ruled side in contact with the film side of the plate, and a somewhat prolonged exposure, due to the light-absorbing power of the two screens, is given, and the plate developed and fixed as usual.

Upon examination we find the images of the letters in our negative are made up of line, with the exception of that of the letter W, which is solid. If we now place the screen on the negative in exactly the same position that it occupied when the exposure was made, we find that the



black lines of the R coincide with the red lines of the screen, those of the G with the green lines, and so on for each letter, while the black of the W coincides with all the lines. The reason for this is obvious. Each line of the screen has transmitted its individual colour and absorbed the other colours. The black lines of the negative coinciding with the lines of the screen which have transmitted the colours, we see the images not in the actual colour or colours of the subject, but in the colour, or combination of the colours, of the lines which, in the exposure, protected the plate from the action of the actual colour or colours.

This difficulty is easily overcome by making a positive by contact from the negative, in which positive the opaque black lines of the negative will be transparent, and *vice versâ*. Placing the screen in contact with this positive in the same relative position with regard to the coloured lines which it occupied when in contact with the negative, and viewing them by transmitted light, we see the images in the actual colours of the subject. The purer the white of the image of the letter W, the nearer perfection have been the manipulations and all the conditions entering into the process.

The German saying, '*Kein Preis ohne Fleiss*,' finds one of its best illustrations in the life of an inventor, and the difficulties which have been, or will have to be, overcome in this process are many. In the very short experience the writer had with the subject, it appeared to him that the success of the process depended, in the first place, on a harmonious relation between the light-absorbing power and quality of the auxiliary screen of the line screen and the orthochromatic properties of the plate. This, of course, also includes the proper selection of the colours of the line screen, their depth and relation to each other.

In the next place, the lines of the screen must be very fine and accurately ruled in intimate contact. Say a screen is ruled 200 lines to the inch, then the image of an object reflecting a preponderance of one primary colour would consist principally of the light transmitted by every third coloured line, be it red, green, or blue, and these lines, of course, would be one one-hundredth of an inch apart. This distance is

visible to the naked eye under these conditions. Therefore the finer the lines the better, but an increase in fineness also increases the difficulties of accuracy and uniformity in ruling. Especially are accuracy and uniformity necessary when a different screen is used in viewing the positive to what is used in taking the negative.

Even if the same screen is used for taking and viewing, it must be uniform throughout, as the rights and lefts of the negative are reversed in the positive, and the screen cannot possibly occupy the same position with regard to either right and left or top and bottom that it did on the negative.

As the coloured lines are all of equal width, the right coloured lines must be brought into register with the transparent (or semi-transparent) lines of the positive, otherwise a false colour-rendering will be the result. If the lines of the positive and those of the screen make the slightest angle with each other, rows of miniature spectrums appear.

If the subject contains parallel lines of a certain distance apart, and

these lines make an angle with the lines of the screen, the result will be a minute grating-like appearance in the picture.

The lines of a brick building standing on a lower plane than the camera causes such a disfiguration. I hope my enumerations of these difficulties will not be taken as an adverse criticism, as they are not so intended. The results in general obtained by Mr. McDonough were very beautiful. An autumn landscape, and such a landscape as only an American autumn can paint—hazy atmosphere, bright-coloured leaves, ready to join their comrades drifting below—all faithfully pictured, emphasise the superiority of this method of representing nature over the usual monotone reproductions.

It is a pleasure to add that Mr. Flora, the able assistant of Mr. McDonough, continues the work of his departed friend.

LENSES FOR ARCHITECTURAL SUBJECTS.

By C. H. Bothamley.

Much has been said and written about the exaggerated perspective shown by photographs taken with wide-angle lenses, that is, lenses which have a short focal length as compared with the dimensions of the plate used. No doubt there is a great deal in some of the objections that have been urged, and, if such lenses are used unskilfully or if they are of extremely short focus, the resulting pictures are, most certainly very unsatisfactory. I am free to admit also that, within certain limits, it is an excellent rule to make use of a lens of as great a focal length as possible. At the same time I do not admit that any definite rule can be laid down except in a more or less conventional and arbitrary way. We are told that, if a lens is used which has a focal length shorter than the diagonal of the plate, the perspective will be exaggerated, but a very little con-

sideration will show that there is nothing very definite about this rule, for, if the focal length of the lens is the same as the diagonal of the plate, the 'angle of view' included will really vary with any variations in the ratio of the length of the plate to its breadth. Further, What is exaggerated perspective? It is quite certain that many drawings by artists of good repute show a perspective that is at least as 'exaggerated' as that of pictures taken with what are generally regarded as wide-angle lenses. It appears to be often forgotten that a scientifically correct perspective drawing is only visually correct when looked at from a particular point; from all other points it is incorrect.

Now, with no class of subjects is a photographer *compelled* to use short-focus lenses so much as with architecture; and, as I exposed during the summer more than 300 plates on architectural subjects, it seemed to be a matter of some interest to ascertain what lenses had been most frequently used, it being understood that it is my custom to use always the longest-focus lens that will give the desired quantity of subject.

Some of the plates were whole-plates, some were quarter-plates. It was found that, in the case of 102 whole-plates for which the exposure data had been recorded, 40 were done with a 6-inch lens, 59 with a 9-inch lens, and 3 with a 12-inch lens. In the case of 206 quarter-plates, 160 were done with a lens of about $3\frac{3}{4}$-inches focal length, and 46 with a $5\frac{1}{2}$-inch lens. So far as I am able to judge very few of the resulting photographs show any marked exaggeration of the perspective.

Now, very few of the subjects were in streets, and the proportion of interiors was not high, and consequently the conditions as a whole were favourable to the use of fairly long-focus lenses. It will be seen, however, that the cases in which it was found practicable to use a lens with a focal length equal to the diagonal of the plate were comparatively few. It is also a fair deduction, since the subjects taken were very varied and very fairly typical of architectural work, that, if for any reason a photographer going in for architectural subjects is obliged to restrict himself to one lens, he will be able to deal satisfactorily with the largest number of subjects if his lens has a focal length about equal to the length of the longest side of the plate. With proper skill in selecting the point of view, the 'exaggeration of the perspective,' if it exists at all, will be slight. But this is merely a practical suggestion; it is neither a rule nor a law.

ZINC DISHES FOR BROMIDE ENLARGING

By W. G. Stretton (Rangoon).

I constantly see complaints in the photographic journals about the wooden dishes with glass bottoms so generally used leaking, with inquiries as to the best way of making them watertight.

Why use such dishes? They are not only expensive (for you want several sets), but are unhandy and easily broken. Zinc dishes will answer every purpose. It is as well to have a set of three for each size of paper that you work, otherwise there will be a needless waste of developer, using a 15×10 dish, for instance, for a 12×10 print. One will be for developing, one for clean water for placing the prints into as they are developed, and one for the hypo.

A separate dish is not required for the clearing bath, since when the print is sufficiently developed the developer is thrown away, and the clearing solution poured on. They should be made of stout zinc, and bound round the edges with stout wire, gently sloping slides, that they may pack inside one another, and fitted with a round knob about half an inch high at each corner to keep them clear of any wet on the table. I have three sets, whole plate, 12×10 and 15×12; they are one and half inches deep, and half an inch larger each way than the paper they have to take.

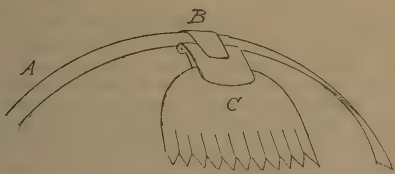
They are painted with oxide of iron outside, and burnished inside with copal varnish, but probably any good enamel paint would do as well. These dishes were made at Calcutta in the bazaar by a native five years ago, and are as good now as when I first had them. Twice a year I thoroughly clean, paint, and varnish them, so that they are always in good order, and never give any trouble.

Remember that hypo and zinc don't agree together, so the hypo dish had better be painted both inside and out with a distinctive colour, varnished inside as well.

A USEFUL SKY-STOP.

By J. A. C. Murray.

A great many good photographs are spoiled owing to the sky getting over-exposed before the rest of the picture is done. This can, in a great measure, be overcome by using a sky-stop, which will cut off a portion of the light. I lately contrived a modification of the old hinged-flap form that will fit several of my lenses of various sizes. The flap being made



of thin zinc, lead, or even stout brown paper, and having its lower edge serrated, it can be made to take an approximate outline of the sky-line, and, raised or lowered by means of the hinge, to cut off the required amount of sky-light.

Although a very old-fashioned contrivance, I think it will amply repay the trouble of using it, by the superior rendering of cloud effects and the reduction of halation where trees, &c., come against the sky.

The hinge is formed of thin sheet brass, one of its wings being made to fold round a piece of strong watchspring, the other one being left open to receive the zinc or paper flap. When in use, the spring is simply coiled and slipped into the hood or front of the lens, where it will remain firmly fixed, and the flap is then adjusted as required.

ALUM.

By S. E. Kelf.

Hardwich's *Photographic Chemistry*, a standard work in bygone days, consisting of 600 pages of closely printed matter, dealing exhaustively with the subject, has not the word 'alum,' as far as I can trace, in the book. The particular copy to which I am referring is of the seventh edition, and over thirty years old. At the present time you can scarcely take up any publication dealing with photography, from Captain Abney's treatises down to the useful leaves called 'Scraps,' but that you will find alum described, discussed, or recommended in some way or other. Even in developing directions alum is invariably mentioned;—mostly on the plate boxes. I suppose the reason of its absence from older instructions was that in the days of collodion plates and albumen paper alum was not necessary. Some never seem so happy, when practising photography, unless they use nearly every chemical that can be squeezed in the instructions, while the more sensible hold that the less you can do with, or the simpler you can get a reliable result—the better. It is an accepted fact that the frilling of dry plates is caused by the gelatine absorbing much water and expanding, and that, if alum be used, hardening of the film sets in, and so counteracts the frilling. Alum also acts somewhat analogous to acids, by clearing films from developing stains, while it has also been averred that alum is good as a hypo eliminator; but, if the plates are made of hard gelatine, and with the precaution of not being allowed to remain an inordinate time in the developer, or allowed to soak in water; or again, if the plates are free from stains, alum is quite unnecessary unless the weather be hot. Better, however, to get the solutions cooler, as every manipulation, by putting in chemicals and then washing them out again, gives tender films a much better chance of reaching the waste box.

The use of alum in photography is, of course, well known, yet there is much to learn by photographers generally in its action when coming into contact with other chemicals. Potassic alum and ammonia alum are freely soluble in water; but it is not widely known that, where the alum salts are in extremely dilute solutions, that is, a small amount of alum to a relatively large amount of water, a white precipitate is thrown down of aluminium oxide, which is an insoluble compound. This is a peculiar characteristic of alum, and is often mistaken by photographers for chloride of silver by the milkiness of the washings. An experiment on this can be made by putting in a tumbler of clean water a speck of alum about the size of a pin's head, and leaving it for several hours, when a relatively large quantity of a white gelatinous-looking substance will cover the bottom of the glass. From this we can infer that, even the slightest trace of alum left in prints or on plates, a deposit of aluminium oxide will be present and cause a white-looking deposit, even if undiscernible at a casual glance; but in the case of alum coming into contact with hypo the effect must be more pronounced. Sometimes, while in a room where a large quantity of toning, aluming, and fixing has been going on, I have noticed a smell resembling very much the odour of rotten eggs. I have felt sure it was H_2S (sulphuretted hydrogen). So with three samples of common alums—potassic, ammonia, and chrome—I made up solutions of each. Into the same I poured some hypo

solution and then corked. In a short time as fine a sample of sulphuretted hydrogen came off as one could wish, and, if left for some days, a deposit of sulphur will form on the sides of the test tube.

Any one studying the composition of alum, which is in the case of potassic alum—

$$\left.\begin{array}{l} SO_2\,Ko \\ SO_2 \\ SO_2 \\ SO_2\,Ko \end{array}\right\} {}^{1}Al_2{}^{III}\,O_6{}^{VI};\ 24\,H_2O$$

and hyposulphite of soda ($Na_2S_2O_3+5H_2O$), and seeing that 'hypo' is prepared by passing a current of sulphur dioxide into a mixed solution of sodium sulphide and caustic soda, and purifying by crystallisation, it will be seen that sulphuretted hydrogen can be obtained. It must be obvious that, the more the alum and hypo can be kept apart, or effectually got rid of, the better for the prints and plates, and, unless mechanical injury is feared, alum ought not to be so profusely used. Hypo alum toning baths for bromide paper are one of the latest recommendations. It may be all right for present brilliancy, but I should fear gradual evanescence of the image, or the very reverse of a permanent print.

RECENT IMPROVEMENTS IN FINDERS FOR THE HAND CAMERA.

By Dr. A. Clifford Mercer.

Amateur photographers everywhere are familiar with the common form of finder. An image projected upon a bit of ground glass set in the top of a hand camera is a faint and troublesome indication of what one may capture by a snapshot.

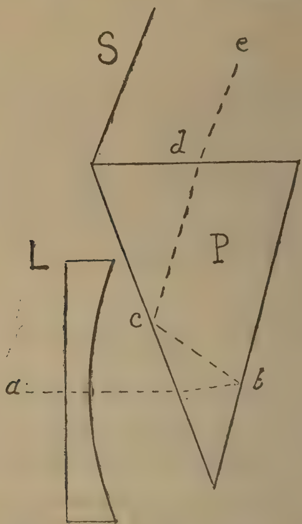
The English 'brilliant' finder is a small rectangular telescope, having an object lens directed forward toward the view, and an eye lens directed upward toward the observer. A mirror between the lenses changes the direction of the rays of light from horizontal to vertical. The front lens projects an aërial image within the finder. This aërial image, seen through the top lens, is bright enough to be distinct in sunshine without shading the finder with a hand or a hood. The brilliant type of finder is remarkably superior to the common form. It has had unstinted and merited praise from the photographic press of England.

That the American iconoscope (image viewer) is worthy its distinctive name is conceded by those who become acquainted with its image, and at the same time note the optical principles utilised in the exquisite little instrument.

The iconoscope has all the brilliancy of the recent English finder. In addition, however, it is superior in several respects. The image of the iconoscope is not reversed from right to left. The user of the iconoscope sees the image at a convenient obliquity, scarcely bowing at all. The eyes glance from the view to its image, and from the image to the view, without moving the head. The upper surface of the top lens in the English finder reflects, as a mirror, images of the observer's face and surrounding objects. These reflections, to some extent, confuse the image seen in the finder. Such reflections are not seen on looking into the

iconoscope, only a beautifully clear image of the view to be photographed. The definition of the iconoscope is not inferior to the definition of a first-class lens.

The iconoscope, seen in section in fig. 1, consists of a negative lens, L, a prism, P, and a black screen, S. The broken line, *a*, *b*, *c*, *d*, and *e* is the path of a ray of light from an object through the finder to the



eye of the observer. The surface, *b*, is silvered. At *c* the light suffers total reflection. At *d* it is refracted. The image is seen in the direction, *e*, *d*. The screen prevents confusing reflections at the top surface of the prism.

The quality of glass and the workmanship necessary for a good prism make the production of the iconoscope somewhat costly. The cost, however, is not so great as to place the iconoscope beyond the reach of many amateurs who admire and require perfect instruments.

A CHEAP BACKGROUND.

By J. H. Wileman.

A short time ago, requiring a plain background for a picture, and not having a suitable one handy, it struck me that a satisfactory article could be made, at a slight cost, by the following means. As colouring is not my strong point, it seems to me that, as it was successful in my case, it would be doubly so in that of any one who was used to painting or artistic work of that kind.

Take a piece of unbleached calico or other suitable material, of the size required for the background, and stretch it on a frame or other convenient support by means of some tacks. Now take a sponge and wet the material evenly all over; while this is soaking in, take a cake of Maypole soap, of a tint to suit purpose ('nut brown' gave me the required tint), and divide it into two equal portions. Mix one-half according to directions supplied with each cake, but make the solution much more dilute; take the sponge and go carefully over the calico with the solution until it is of a uniform tint, taking care that all sharp outlines are softened as you go on. With a little practice this will very easily be done. Allow this to soak in (but not to dry), and, while it is doing so, take the remaining piece of soap and make with it a *strong* solution, as directed. Dip the sponge in this and proceed to dab the portion of background required darker than the main portion, graduating it off at the edge of the darker shade, and merging it into the lighter; do this carefully, and it will be found that a splendid graduated background is the result, equal in usefulness to one costing as many shillings as this does pence. Should it be desired to alter the tint at any time, another tint may be superimposed, full details being given with each cake of soap of the effect of one shade on another. The sponge used will naturally be dyed, but otherwise none the worse. A piece of soft rag may be used in place thereof, but will not be so easy to use.

PHOTOGRAPHY BY ARTIFICIAL LIGHT.

By R. J. Moss.

There is no doubt that photographers, as a rule, do not have a particularly rosy time during the winter months, owing to the short days and bad light; in fact, there are often days when it is impossible to get a negative at all, consequently an artificial light would be a great boon, provided, of course, that it was reasonable in price, easy to obtain, simple in management, and not offensive to the sitter. Many illuminants, by which negatives can be obtained, have been introduced, but all fail in one or other of the points above mentioned. The electric arc stands first, but is only available to a very limited number of operators, while the cost is a very considerable item; limelight or oxyhydrogen comes a good second, though the trouble of getting oxygen and attending to the lime, &c., almost preclude its use; magnesium, in various forms, does wonderfully well, but there are many objections, not the least being smoke and smell, while the suddenness of the glare frequently disconcerts the sitter. However, a new illuminant has recently been introduced, called acetylene, which is produced in the most simple manner, and, being a gas, is easily controlled and directed; the luminosity is very intense (about 240 candle power), while the light is absolutely white, very nearly approaching daylight. These qualities render it worthy of the careful consideration of the photographer, but there is yet another quality, even more important still, viz., diffusiveness, the light seems to penetrate every corner of the room, giving to all objects very nearly the same appearance as in the daytime; and, though it can be intensified in any particular direction by the aid of reflectors,

even then unnatural appearances or ghostly effects are scarcely apparent.

I have no doubt that many photographers know all about it; but, as there are a lot who do not, I purpose giving a brief description of what it is and what can be done with it, with just a word or two on how it is obtained.

In the first place, a substance called calcium carbide is produced, by submitting lime and coke (or some other form of carbon) to the intense heat of an electric furnace; the resultant matter, when cooled, is a hard, greyish mass, which, when broken up, is not unlike the original coke, though much heavier; this is carbide of calcium or, as it is now generally called, calcium carbide. Some few years back an American chemist, named Wilson, experimenting with this substance, accidentally discovered that, if brought into contact with water, it evolved a gas, while subsequent researches proved the gas to be inflammable and also to possess great illuminating power; in reality, it turned out to be the acetylene of the laboratory, which had been known to chemists for over fifty years, but which could only be produced at great expense and with considerable trouble and risk. I will not dwell upon the subsequent experiments, the encouragements and disappointments which were experienced before it was ultimately placed on the market; suffice to say, that difficulties of no simple nature were met and surmounted, not the least of these being to find a medium by or through which it could be utilised for illuminating purposes. The main element that gave to the gas its wonderful brightness, viz., carbon, was by the very superabundance a tremendous source of trouble, which has not even now been entirely overcome, though sufficient has been accomplished to allow of the general use of acetylene either for photographic, lantern, or domestic illumination.

Acetylene may be produced and made available for use in two ways:—

Firstly.—By submerging a quantity of carbide in water and providing a receptacle which will hold all the gas given off and at the same time exercise the necessary pressure to force the gas to the burners; this plan would require a very large holder to contain the necessary quantity of gas, and is therefore quite out of the question for photographers, who must rely upon the second as the only system by which a portable apparatus is possible, viz., an automatic arrangement, where the presence of a certain quantity of gas immediately removes the carbide from the influence of the water, this action at once arresting the decomposition of the carbide and the evolution of gas. There are three groups of automatic generators:—

1. Those in which the water is dripped on the carbide, the supply of water being shut off by the raising of the gas-holder.

2. Those where the carbide is suspended in a simple gasometer, which, being raised by the gas, lifts the carbide from the water.

3. Those in which the gas-holder is fixed and the water forced back by the pressure of the gas as it is generated.

In all kinds the consumption of gas by burning allows the water to again reach the carbide. Judging by the patent intelligence, there must be something like 200 different acetylene-generators in the United Kingdom alone; consequently I am not going to select or mention any as specially suitable, I would rather emphasise those features which are

absolutely necessary, viz., simplicity, good, regular pressure, and ease of charging or recharging; portability is, of course, understood to be the most important, so that customers can be visited at their own homes, as this would prove an immense advantage for invalids or ladies in evening toilettes, &c., and would naturally lead to increased business.

There are quite a number of patent burners on the market, but the one most suitable for photography is still Bray's 00000 union, which is retailed at 2*d.* each, or 1*s.* 6*d.* per dozen. It is true that after a time carbon is deposited in the gas passages in such a quantity as to spoil the shape and interfere with the brilliancy of the flame, but the cost is so slight that they can be easily replaced, and one will often last six months, and generally three, before it becomes unfit for use, provided it is cleaned occasionally with a stiff tooth or other brush. I will therefore take this burner as the standard of light and cost. The photometric capacity is sixty candle power, the same as that of the incandescent mantle; but one Bray's 00000, with acetylene, is quite equal in illuminating power to two incandescent, using coal gas. This burner consumes one cubic foot of acetylene gas per hour; one pound of carbide gives off five cubic feet of gas; therefore, taking the cost of carbide at 5*d.* a pound, each burner costs 1*d.* per hour; so that, if six burners are used and the operation takes ten minutes, a negative is produced for 1*d.* Some generator-manufacturers claim that a good photograph can be obtained with one-second exposure, provided that a *rapid* plate be used; this may, or may not, be correct; but a really good photograph of the writer was secured with two burners only (an ordinary lantern jet, with reflector, being used), the exposure was about twelve seconds, with an ordinary rapid plate; one of these was submitted to the Editor of The British Journal of Photography for his opinion.

The most suitable arrangement, however, is six burners, with mirror or white-enamel reflector, to throw the maximum of light in the direction required; with this a photograph nearly equalling daylight results may be obtained by only a slightly increased exposure, though this can be reduced by the use of extra-rapid plates.

A good deal of nonsense has been talked and written about the danger of acetylene; it is perfectly true that explosions and accidents have taken place, but nearly all these were caused by gas being compressed in the same manner and to the same extent as oxygen. This practice is now universally condemned and generally discarded; experience has proved that, when acetylene is produced in and held by a reliable and carefully constructed apparatus, of low or moderate pressure, it is *perfectly safe*, though one *must remember* that it *is a gas*, and consequently *no light should be brought near* the generator when charging, recharging, or emptying the apparatus, or *even to look for a leak;* and, though the quantity of gas present at any one time in an automatic generator is too small to do serious damage, even then it is much better not to run any risk at all.

I think enough has been said to give a general idea of the properties and methods of production of acetylene; I have shown that it is suitable for photography and that it may be used with confidence and safety; I would also remind readers that it has long since passed the experimental stage and is at the present time being used in a large number of studios where electric light is not obtainable. I will now close with one word of

caution to intending users: Do not introduce *any apparatus* into your studio for *actual work with customers* until you have made yourself thoroughly *familiar with the working*, and this is better done out of doors, on account of the smell which is allowed to escape when apparatus is opened by the inexperienced.

THE CORRECTION OF DISTORTION PRODUCED BY TILTING THE CAMERA.

By C. Welborne Piper.

I have been investigating this subject for some time, but find that I cannot corroborate the results arrived at in the editorial article of August 20. So far as I have at present progressed, as the result of tentative graphic experiments, it appears that the angle of inclination of an approximately correct copy is never less than the original angle, yet the writer of the article in question, in the particular case he is considering, makes it about 11° as against an original angle of $12\frac{1}{2}$°. He also makes the respective angles of negative and copy equal, yet I find that in all cases, with the exception only of a few never likely to be met with in practice, the required angle of inclination of the negative is less than that of the copy.

Furthermore, upon testing the diagram described in the article, it appears that the 'correct' copy is not square, the width being greater than the height. There is obviously an error somewhere in the calculations. I understand that the distorted image referred to in the article of July 23 is the same as that described on August 25. In the former article it is stated that the mean width of the image equals 4 inches, and in the latter one that the maximum and minimum widths are as 25 : 23. The greatest width must, then, be $4\frac{1}{6}$ inches, and the least $3\frac{5}{6}$ inches, and, as according to the construction of the diagram described in the second article, the top of the image is enlarged to the width of the bottom, it follows that the width of the copy must be $4\frac{1}{6}$ inches, while the height scales only 4 inches.

To secure a corrected image 4 inches square, the top of the image should be enlarged and the bottom reduced to exactly 4 inches; but it is certainly doubtful whether it is possible to do this and at the same time preserve the correct height. Up to the present my investigations tend to show (I cannot speak positively) that the perfect correction of the distorted image is an impossibility unless the lens is precisely the same distance from the negative as it was originally. This practically means that the original lens cannot be used, and one of a shorter focus must be substituted. In this I believe I am in agreement with Mr. Wheeler, judging by his letter of August 6 (I cannot refer to his original articles), but on another point I must disagree with him absolutely. He states, if I understand him correctly, that the vertical distortion of the image depends solely upon the angle of inclination, and not upon the distance. This is wrong, as can be clearly proved by graphically testing the effect of moving the camera to and fro upon the axial line of the lens without disturbing the angle of inclination. In practice this condition might be fulfilled in the case of a building situated upon a steep slope; if the ground is level, the angle alters with the distance, and the effect of

different distances upon the relative amount of distortion is not so apparent. If we examine separately the distortion of the upper and lower portions of the image, below and above the axial line, we find that the former is reduced in height at any distance, but the height of the other may be either increased or reduced.

The nature of the distortions of the lower part of the image at different distances may be classified as follows, a correct image taken at the same distance being the standard of comparison in each case:—

1. At a certain distance (equal to the actual height of the lower part of the object multiplied by the cotangent of half the angle of inclination) the width is increased without the height being affected.

2. Nearer than distance 1, both height and width are increased.

3. Farther than distance 1, the width is still increased, but the height is diminished.

As regards the image as a whole—

4. At a certain distance nearer than 1, the total height of the image is correct.

5. At a distance nearer than 4, the total height is increased.

6. Beyond distance 4, the height is diminished.

7. Beyond a certain distance (near 1), the total height is less than the minimum width.

8. The horizontal distortion of the whole image decreases steadily as the distance increases. The vertical distortion, or dwarfing of the image, increases with the distance beyond 4.

The distance at which exposure is usually made is somewhere between 1 and 4, consequently the conditions of greater or less distances are not likely to be met with, but perfect correction of the image would appear to be impossible under some of these abnormal conditions, and so the question arises, Is it really possible in any case? In No. 3, for example, it is necessary to increase the height and simultaneously reduce the width of the lower portion of the image, while both width and height of the upper portion must be increased. The method of making such a correction is, at any rate, not very apparent, for how can the width of the lower portion be reduced without also further reducing the height? This is an exaggerated case out of a number of others which are all more or less governed by the same conditions.

If absolute correction is impossible (I am not prepared to say positively that it is), excepting under the condition that we retain the original relative position of lens and negative—using a lens of shorter focus so as to bring the image within a reasonable distance—to meet other circumstances we must rely upon obtaining approximate accuracy by tentative adjustment. Here the main difficulty is the inconvenience of adjusting both negative and copy when they are some distance apart. If a studio stand with vertical rack adjustment is available, the trouble is lessened, for, by raising or lowering the camera (at the same time lowering or raising the lens to keep the image upon the plate), an oblique view of the negative can be obtained, and much the same effect produced as by inclining the negative. The swing is, of course, also brought into play, but the whole of the adjustments can be made at one end of the system without touching the negative. If the distortion is considerable, the negative may be first slightly inclined, and this will lessen the extent to which it is then necessary to raise or lower the camera.

MICRO-PHOTOGRAPHY AND THE POLARISCOPE.

By W. J. Bishop.

In the course of my studies in the polarisation of light and attendant experiments thereon, I have observed that the usual method of arrangement of the polariser and analyser does not give the best results to be obtained from the use of Nichol's prism attached to the microscope. I have tried a method of arrangement, which, so far as I can learn, has not been tried before. The usual plan has been to take out the top lens of the eyepiece of the microscope and insert Nichol's prism in its place, the polariser being placed beneath the microscope stage. In my arrangement I place the Nichol's prism as close to the objective as I can, but do not alter the position of the polariser. This arrangement not only gives a much higher magnifying power with the same lenses, but also gives a black back-ground to the crystals, and enables the image to be thrown on the focussing screen of the camera and a photograph of the crystals to be taken. The exposure required varies according to the magnifying power of the objective.

COPPER AS A DEVELOPER.

By Edwin Banks.

When photography was young, in the days of the Talbotype and wax-paper processes, gallic acid, and afterwards pyrogallic acid, were the only developers the photographer had at command. It was not until after the introduction of collodion upon glass that the more energetic and clean-working ferrous sulphate was introduced, and from that time pyrogallic acid ceased to be employed in the studio, and became almost unknown to the working photographer. Modern dry plates, with films chiefly of bromide of silver, without any free nitrate present, could not be reduced by ferrous sulphate, and thus pyro alkali once more came to the front, and has occupied premier position ever since.

Endless researches have been and are still being made in the almost infinite region of the carbon compounds in order to discover new and more powerful reducers; but, although many have been added to the list, pyro still holds first place, and probably will continue to do so as long as such investigations are confined to complex organic compounds. It is quite within the region of probability, however, that our old and tried friend pyro may have once more to retire in favour of a more energetic developer.

A few months ago I drew attention to the remarkable fact that cuprous chloride and cuprous bromide acted most energetically in developing the exposed plate, and for some time I thought that another most powerful reducer must be added to our already long list if only certain peculiarities of its action could be overcome and controlled. These were, first, almost uncontrollable energy, which the addition of free bromide or chloride only increased; and, second, a thinness and flat appearance in the most exposed parts of the film, sometimes almost amounting to reversal. The negatives were full of detail and vigour in the deepest shadows and middle tints, but, beyond that, both density and

detail seemed to be lost. Further experiment and investigation, however, revealed the cause of this, and I was very reluctantly compelled to relinquish any hope of practical utility in this direction.

Cuprous chloride and cuprous bromide are white crystalline salts, insoluble in water, but soluble in ammonia and alkaline chlorides or bromides. Their solution in ammonia is very unstable, passing rapidly, by absorption of oxygen from the air, from the colourless cuprous to the deep blue cupric state. The chloride and bromide solutions, however, keep fairly well, but do not act as a developer until rendered alkaline with ammonia. As is well known, development consists of reduction of the exposed bromide of silver to the metallic state and a simultaneous oxidation of the developer. This oxidation in the case of the copper subchloride and sub-bromide results in the formation of cupric chloride and bromide, which first acts in restraining further development and then bleaching in the well-known manner the parts that have been developed, so that there is the curious phenomenon of a picture being perfectly developed and then undeveloped in the same solution. Further investigation showed this development was not due entirely due to the copper when in the state of chloride or bromide. This may be best explained in the form of the equation

$$2Cu_2Cl_2 + O = Cu_2O + 2CuCl_2$$

by which it will be seen that the double molecule of cuprous chloride is split up by the oxidation, and cuprous oxide and cupric chloride formed.

The development, therefore, is mostly due to this cuprous oxide, the powerful reducing properties of which were pointed out nearly twenty years ago by the late Mr. Carey Lea in the pages of THE BRITISH JOURNAL OF PHOTOGRAPHY. Up to the present time, however, no attempt appears to have been made to render this available in photographic work.

Cuprous oxide is a ruby-coloured powder, insoluble in water, but freely soluble in ammonia, in which it forms a colourless solution, which, however, is so greedy for oxygen that it absorbs it rapidly from the air, and is converted into a solution of cupric oxide of an intense blue colour. The best method of keeping it is to put a freshly made portion of the cuprous oxide and an equal quantity of copper turnings or filings into a stoppered bottle and fill up with ammonia. This would keep colourless fairly well as long as the atmosphere has no access to it, and any cupric oxide formed by opening the bottle for use is speedily reduced by the copper filings.

My object in writing this is to point out a method by which the energy of this powerful reducer may be controlled, and its valuable properties rendered available to the photographer. Mr. M. Carey Lea recommended that a solution of gallic acid, with the addition of one or two drops of the ammonia cuprous oxide, should be employed, and this acts very powerfully; but it is rapidly exhausted, and loses all developing power, whilst the gallic acid becomes black and dirty. Also, to get a complete development before atmospheric oxidation took place, it was necessary to add so much of the cuprous oxide solution that it was absolutely uncontrollable in use, the image flashing out rapidly and passing so quickly through all its stages of development up to fog that the operator had little chance of a successful result.

The method of overcoming these difficulties is, however, compara-

tively easy, and depends upon the fact that the salts of hydrazine and hydroxylamine have the property of reducing cupric salts to the cuprous state. When an ammoniacal cuprous oxide solution has become of an intense blue colour from oxidation, the addition of a few grains of either of these salts at once decolourises it and restores its energy as a reducer. If, therefore, to a solution, say, of five grains per ounce of hydroxylamine sulphate, one or two drops of cuprous oxide solution is added, a clear colourless developer of great energy is obtained, and one that is fairly stable, and also one that is clean working and does not in any way stain the film. It is easy to show, if space permitted, that the development is not in any way due to the hydrazine or hydroxylamine. The sole function of these salts is to *reduce the reducer* by robbing the cuprous oxide of the oxygen it has absorbed during development, and the developer will thus retain a uniform energy until the whole of the hydrazine or hydroxylamine salt is exhausted. In practice it will be found that the sulphates are better than the hydrochlorides in order to avoid the formation of cupric chlorides as a by-product. A small portion of cupric bromide is formed, but that only in sufficient quantity to make a cleaner image by its powerful restraining action.

Another difficulty, however, arises from the oxidation of the hydroxylamine salts, and it is one which has caused the disappearance of this developer from the photographic laboratory. This will be seen by the equation

$$NH_2OH + O = H_2O + NOH.$$

The result of oxidation is the formation of water and the inert hyponitrous acid, which forms in the film in small bubbles or blisters, which gradually increase in size until the film is either riddled with holes or floats bodily off. The addition of grape sugar or of oxidised cane sugar, however, completely prevents this.

In the use of cuprous oxide as a developer, it will be found necessary to considerably reduce the exposure of the negative, yet development will be found to be clean, free from fog, and perfectly under control.

Although not directly connected with my subject, yet a hint to those who are in the habit of employing ferrous oxalate either for negative or paper prints may be useful; that is, that hydrazine or hydroxylamine salts also reduce the ferric salts to the ferrous, and so prolong the life and increases the energy of this useful developer.

ON ENLARGING AND OTHER MATTERS.

By 'Hussar.'

At the risk of going over ground that may have been passed over before, I here will jot down some hints on enlargements and other matters which I have found very useful. Judging from the questions of correspondents to editors of photographic journals, there appears to be nothing, however simple and however often asked before, that is not again and again queried. One cannot but marvel at the inexhaustible patience required from the long-suffering editors. Most of these anxious inquirers, if they

practised a little experimenting, would save a great deal of trouble to themselves and others, and, by finding out for themselves, fix the information so obtained permanently in their minds.

I began photography many years ago without the aid of an instructor; I was in an isolated station in India, there were few then of those useful handbooks that are so plentiful now, and consequently I had to puzzle out most things for myself; of course, the dust bin was full of my failures, and I cannot exactly say that I found photograhy a specially inexpensive pursuit; but it made me think for myself, and I had no occasion to regret it.

For my enlargements from quarter plate I have an ordinary enlarging lantern; but, as I enlarge a good deal from whole-plate size, and being unwilling to pay the considerable sum necessary for a lantern with an 11 inch condenser, I constructed a daylight enlarging apparatus in the following manner:--My dark room is about 10 feet square floor measurement, and has a sloping roof on one side, facing the north, with a small sky-light in it, 18 in. by 12, about 5 feet from the ground. This sloping roof I find a great advantage, as it does away with the necessity of a reflector, an unsatisfactory arrangement, in my opinion, at the best of times, and permits of an even illumination. Being a bit of a carpenter, I constructed a sash to fit over the window, having four grooves into the three outside ones, ruby glass, of different degrees of density slide; the inner groove carries a quarter-inch board, removable, in the centre of which is an opening with a rabbet round it large enough to take a whole-plate negative; a long extension camera is fixed over the opening by hinges to the board and is closed by a hook and eye; the negative is kept in position in the opening by means of two buttons on each side, at the distance of 18 inches beneath the camera, and parallel with the axis of the lens runs a wooden bar 2 inches square bolted to the slope of the roof at one end, and the other end resting in a wooden socket fixed to the floor; on this bar runs a saddle which carries the easel, and it can be clamped to any part of the bar, according to the size of the enlargement required. The whole machine can be taken down or put in position again in two or three minutes, and by making marks on the bar and the camera the correct focus can be immediately determined. Should all the actinic light be required to be shut off, one or more of the ruby glasses in the window can be lowered. A further 'dodge' I find useful, I fasten with drawing-pins on the easel narrow strips of black paper along the length and breadth of the picture, as thrown upon the easel; I can then fasten my bromide paper squarely on the easel in a faint light, without using a lens cap with an orange or ruby front.

A wrinkle which appeared in the Almanac for 1894 I have found of the greatest use. It is for focussing dense negatives, or, in case of a small stop being required, to fix and dry an unexposed plate of the size of the enlarging negative, then draw horizontal and vertical lines on it ½ inch apart, with a fine mathematical pen and Indian ink, substitute this for the negative, and the finest focussing can be obtained without difficulty.

The developer I use for bromide paper is invariably amidol; it requires less exposure, a blessing when the illuminant is an oil lamp, and the development can be arrested at any moment and restarted merely by flooding with water, which is not the case with the iron developer.

PLANTS FOR THE STUDIO.

By Chas. H. Evans.

From a decorative point of view, as well as an aid to photographic composition in portraiture, it has long been recognised in good establishments that plants are a desiderata. Therefore a short list of some good foliage ones that are often passed by will be useful to many.

One reason why plants do so badly as a rule in studios is that the atmosphere in those places is usually too dry and stuffy, and the usual studio is too lofty a building to be good as a plant-house. Still there are some things that object less than others to those unnatural conditions, among which are: *Aspidistras*, both the green and the variegated varieties; *Ficus elastica* (the well-known indiarubber plant); *Aralia Sieboldi* (said also to prevent flies being a worry; I cannot verify this, not being troubled with flies).

The above are often found in studios, and are eminently useful; so are the following, which are not so commonly met with: *Dracena indivisa* and *D. australis*, also *Anthericum lilastrium variegata*.

As regards palms, all are beautiful, but the majority are a snare and a delusion as regards long life in a studio; but *Seaforthia elegans* is to be depended on, and *Latania borbonica* and *Kentia balmoreana* are fairly good for some time. I once used for a couple of years an *Abutilon*. This plant is apt to grow very leggy, so pinching in occasionally makes it grow bushy, and its vine-like leaves are very pretty in a corner of a photograph.

Of shrubs proper, the broad-leaved Veronica is very pretty, so is a myrtle. Climbers in pots are very effective if naturally trained over a few rough twiggy sticks, the large-leaved Virginia creeper (*Ampelopsis hedercea*), Irish ivy, also the grape vine.

Of deciduous trees, splendid use may be made of small specimens, in seven-inch pots, of the following: Sycamore, horse-chestnut, mountain ash, fig, variegated maple, and the laburnum. In the autumn, when the deciduous plants drop their leaves and are but little use, plunge the pots to their rims, out of doors, in earth, and they are all right again next year, when the buds begin to burst. The evergreen varieties, if put out of doors when there is a warm rain on, is a perfect reviver, or a syringing with water, about 65°, is just as good. A very little trouble, indeed, is the attention required for a few plants, and their usefulness cannot be over-estimated.

NOTES ON HAND CAMERA WORK.

By Herbert S. Starnes.

Two important obstacles to successful hand camera work in the present day often appear to be, failure in obtaining a proper balance of light and shade in the picture, and slight want of sharpness, due to vibration of the camera. Very few snap-shottists trouble sufficiently about the relative amount and position of the lights and shadows in the subject they are about to photograph. They think only of the size and grouping of the objects, and yet we find that, as a rule, the success of the best pictures

at an exhibition is due simply to the proportion and position of the principle lights and shadows. The printing and toning are no better, the quality of plates and lenses used are the same, no better grouping or balance of lines. Nothing but the light and shade in them to give them their beauty. Sometimes they only consist of a dirty pond, a bank, and a few clouds.

Therefore, instead of bothering so much about printing processes, lenses, plates, &c., study the laws of light and shade. If a picture, engraving, &c., pleases look at it from from a distance where you cannot distinguish the detail, and note the positions and strength of the lights and shadows, and then try to reproduce them in your negative. If a portrait, you have the background and accessories to group round the figures to obtain the necessary light and dark half-tones, you do not require to lump in all the odds and ends to be found in the window of a second-hand furniture shop as accessories.

If a landscape, there is the sky space to fill in, but let the clouds be nothing more than a background to the landscape, to connect and complete the range of tones in the latter.

As to vibration of the camera during exposure. I have always held that the proper place for the button or release is in the front of the camera, with a backward push towards the plate, and that the first finger of the right hand is the best to use, as it is the most independent (through long practice) of the other muscles in the hand. Some cameras have a trigger or release on the right hand side, to be depressed with the thumb, the first finger holding the bottom of the camera. Most people if they move the thumb downwards towards the first finger will find that that finger will endeavour to meet it half way, *i.e.*, the muscles will force both towards one another, and I believe that vibration of the camera on exposure, is not due to the action of the thumb, but to the muscles of the first finger giving a slight cant to the camera upwards. This might be avoided by having a dummy spring at the bottom of the camera (of the same tension as the trigger), for the first finger to press against, and I believe when two hands are used, that the vibration is due to the muscles of the left hand holding the camera too firmly, producing a recoil when the push is given to the button on the right side of the camera by the right hand.

A HINT REGARDING THE CYANIDE OF SILVER INTENSIFIER.

By H. J. Channon.

Some years ago I carried out a long series of experiments with the object of examining and comparing all the various methods of mercurial intensification then in use, measuring the gains made in printing density in each case, and testing the particular qualities resulting from each variation in treatment. As may be supposed, it proved a very extensive undertaking, even though done in a somewhat rough and imperfect manner; and, as a matter of fact, I did not accomplish my object, so the voluminous notes made at the time are likely to be of little use. Still, some matters are touched upon in these notes which may possibly be interesting, and it is about one of them, relating to the cyanide of silver method of

treatment, that I am writing these few lines. Mr. Chapman Jones has recently brought the subject of mercurial intensification very much into notice by the publication of valuable and interesting papers, in which he attempts to treat the matter on sound scientific principles. His opinion of the cyanide of silver method is decidedly unfavourable, and, on the whole, I am inclined to take a similar view, having found like him that plates so intensified are very liable to discolour in the clear parts on insolation; but yet, as this process is very much employed in practical work, and will probably long continue to be used, it may be worth while to give a hint concerning it. Mr. Jones objects to the process also on the ground that it alters the ratio of the gradations of the densities of the negative, but this, I think, is perhaps not an essential feature in it, and may depend upon the matter I am about to refer to. The point I have in mind, then, is simply that the results of this method of intensification must depend very much upon whether the solution of cyanide of potassium is *fully saturated with cyanide of silver.* Cyanide of potassium alone has, of course, a strong reducing action, and, if only a small proportion remains uncombined in the solution, it will attack the deposit during the whole time of immersion, acting especially strongly on the weaker parts; hence the degree of intensification obtained must then become most uncertain, while at the same time the ratio of gradation will be disturbed. Now, when the directions usually given for preparing the solution are followed, that state of things must almost necessarily result. We pour a solution of cyanide of potassium a little at a time into one of nitrate of silver; at first a thick creamy fluid results, with a large quantity of very fine matter in suspension; suddenly, when the cyanide becomes present in excess, and its solvent action commences, the fluid becomes quite clear, owing to the finest particles being first dissolved, and at every further addition it is always the finer of the remaining ones which are soonest to disappear; consequently, at the end of the process, there will remain only a quantity of coarse, heavy grains which settle quickly to the bottom of the vessel. The last additions will have left a proportion of free cyanide of potassium in the supernatant solution; its solvent action on these coarse grains will be very slight, and, as only an extremely small quantity of the solution can come at any particular time into actual contact with these particles, it will easily be seen that for the whole bulk to be fully saturated with silver from that source in any reasonable time is not to be expected. The remedy is not difficult to discover; by simply reversing matters and adding nitrate of silver solution to potassium cyanide solution till a permanent precipitate remains, a fully saturated solution is easily obtained. The importance of the method of mixing is very familiar to photographers in the case of the ferrous-oxalate developer.

One of my experiments rather strikingly illustrated this matter. A plate having a longitudinal band of even density all through, estimated to correspond to a *printing transparency* of ·26, was cut into a number of strips; these were fully bleached (all together) in the bichloride solution, thoroughly washed, and, for convenience, dried. A silver cyanide solution had been prepared in the ordinary manner, well stirred, and plenty of time allowed for as much as possible of the silver precipitate to be taken up. One strip was immersed in this till apparently fully blackened (between five and ten seconds), then quickly and thoroughly

washed; it showed great increase of density. Another strip was next immersed in the same solution and darkened equally quickly, but was left in for five minutes before washing. A remarkable change had then taken place; practically the whole increase of density had been lost, and scarcely any difference in appearance could be noted between that strip and an unintensified one from the same plate. My subsequent photometrical work showed that in the case of the shortly immersed strip the original printing transparency of ·26 had been reduced to ·09, while in the other it came out at ·23, or practically the same as before treatment. A corresponding experiment was next made with a silver cyanide solution mixed as described in the reverse manner, one strip being immersed for seven seconds and another for seven minutes. On examination these proved to be practically alike, visually and photometrically, and just similar to the shortly immersed one of the previous experiment, no reduction, in this case, having resulted from prolonged treatment. Evidently, then, the second solution is the more trustworthy one, and, although good results may be gained by *correctly timed* treatment with the other, its effect must always be uncertain and its action on gradation injurious. *Short immersions* in this darkener I have found, too, are to be avoided, as rendering the plates especially liable to discolour afterwards.

ALBUMEN PAPER *V.* GELATINE.

By William Brooks.

Have our prints improved since the introduction of gelatine paper in the place of albumen? As far as my experience goes, I think not. I have yet to see a gelatine printing-out paper that will approach in quality the old albumen paper print.

There are now many papers made under various names. Some say gelatine prints are more permanent than on albumen; only the other day I was examining some prints on gelatine, and found worse evidence of fading than on albumen. Nearly all the papers, independent of fading, have an inlaid look about them. I am inclined to think that the truth is that it meets the rage for the so-called quick printing, thin negatives. In these days of high pressure speed, neither permanency nor quality are aimed at, but only getting the work out of hand.

Take, for instance, prints made say thirty years ago, there was more pluck and vigour than the productions of to-day. At the present time I have some prints made on albumen paper over that time considerably, and they are as fresh as the day they were made.

We have not to go far if we look into how those prints were made. In those days the negatives were of a different type, being much more intense than the ones of the present day. I remember the time we used to sensitise the paper with 100 grains of nitrate of silver to the ounce of water, then as time progressed the salting and sensitising began to get weaker and weaker, and I dare say now that not more than twenty-five grains of nitrate to the ounce is used. Before printing in silver was understood as it is now, the sensitising solution was too strong for the negatives of that time, and after a time a sixty grain solution was used with a lower salted paper, and this seemed to give the perfection of prints.

Albumen was always blamed for fading or turning yellow; that might hold good in some cases, especially if stale albumen was used.

All the photographic papers were supposed to be made from rags, and I always attribute one cause for fading to how the paper was sized. I know that any cotton fabric sized with gelatine mostly turned yellow after a time, whereas a paper sized with starch always kept white. I have some paper in my possession now (photographic) bearing the date 1850, as perfectly white as on the day it left the mill; this is starch sized.

Any print made on albumenised paper intended for framing I always give a good coat of encaustic paste, this is a great preventative against fading. I therefore think that albumen paper will hold its own for ordinary printing for many a day yet.

FEW REMARKS ON CARBON PRINTING.

By V. C. Baird.

Many workers in a small way must have been deterred from attempting the most beautiful of our printing processes, namely, carbon, from the rather misleading statements made in the text-books, which, though correct, are insufficient and not the whole truth. For instance, the general statement that home-sensitised tissue will only keep two or three days at the most, alone prevented me taking up carbon printing, as I might sensitise the tissue and then find something come in the way to prevent my doing the prints in time to save it. Although the manufacturers' tissue keeps for a fortnight, each colour is only supplied in packets of one dozen pieces, the result being to the small worker, if he wishes to do several prints of different colours, he has to buy one dozen pieces of each colour, and, after doing one or two prints, the rest of the material is lost, making the process very expensive. Home-sensitised tissue can be made to keep perfectly for ten to fourteen days, if the sensitising bath is made just sufficiently alkaline with liquor ammonia to turn red litmus paper blue. The instructions given in the handbooks for sensitising the tissue are explicit and very easily carried out. If the tissue is bought in bands and cut up in pieces, say, equal to four or six half plates, quarter of an hour will sensitise a considerable quantity of tissue, so the question of time occupied sensitising need hardly be taken into account. I do more carbon printing in winter owing to the dark evenings; the tissue will, if sensitised about six o'clock, be quite dry by ten o'clock if hung in an ordinary sitting-room where there is a fire. After the tissue is dry it should be cut up and kept under pressure. I use an ordinary printing frame with an opal glass covered with black paper; and this leads to another point in the text-books, or, rather price-lists, the special apparatus recommended is simply appalling, a quarter plate developing tank, 4*s.*—mine, made by a local tinsmith, 24 × 18 inches, cost the same. Little or no additional apparatus will be required beyond the average amateur's outfit.

The sensitising bath generally recommended is one ounce bichromate of potassium to twenty ounces water, this strength makes a tissue far

too rapid for the average gelatine negative of to-day, forty ounces of water will give a rapidity much more manageable, and about two to three times that of ordinary P.O.P. However, the extra rapidity of the stronger bath will be found useful in the darkest days of winter. For transparency work the bath may, with advantage be still further diluted, namely, sixty to eighty ounces water, to one ounce bichromate, especially when using tissue other than transparency. Another matter often referred to is the continuing action in printing after the exposure has been made, this is quite true if the tissue is taken out of the printing frame and exposed to the air, but if the print is kept in the printing frame under pressure this continuing action may be disregarded.

ALL HALLOWS', BARKING.

By C. H. Crosby (Chicago).

On the eve of my departure for a brief vacation in England in 1895, a friend of mine, who is an enthusiast about the history of the Tower of London, and the possessor of a large collection of lantern slides pertaining thereto, remarked that he had never been able to procure any photographs or slides of the ancient Church of All Hallows, Barking, which he much regretted, as it had an intimate connexion with the Tower. My quest in London was equally unfortunate, and, moreover, I was somewhat surprised to find that many of the dealers in slides and prints had never even heard of the old church. Nothing was left but to attempt some photography on my own account, in the course of which I had a provoking but amusing experience.

I paid a preliminary visit to the church, and was told by the good dame in charge that, to her knowledge, the interior of the church had never been photographed, except some years before, by a professional photographer. The thought that I was upon ground untouched by brother amateurs gave great zest to my feelings, and, having obtained permission from the Vicar of the parish, I appeared upon the scene the next day duly, equipped for the undertaking. It may not be out of place, however, as The British Photographic Journal Almanac is read by thousands who are not Londoners, to say a word or two about the church.

All Hallows' (All Saints'), Barking, is near the Tower of London, at the foot of Great Tower-street. It is mostly of that style of architecture called 'perpendicular,' but has a charm for its lack of strict adherence to any one style. I could not ascertain the date of its erection further than that it was before the time of Richard I., and that it was founded by the nuns of Barking Convent in Essex, and it is said that the Abbess of the convent, when she came to London with a numerous train of officers and retainers, would hear mass in the church before proceeding with her business affairs. The church is sadly crowded and elbowed by narrow streets and buildings, and great slices of its ground have from time to time been cut away for street purposes. A police office is on the opposite side of a narrow street at the west end of the church, and some thrifty vestrymen, so I was told, built many years ago a warehouse against the church on a small corner by the spire, that had escaped base uses previously. Across the way is a tavern called the Czar's Head, said by some

to be the original tavern, and by others to occupy the site of the original tavern where Peter the Great used to resort after his labours in the shipyards on the Thames hard by were finished. The tavern is still liberally patronised.

The east end of the little graveyard that is left backs up against a big coffee and spice mill, the second-story window of which afforded the only practicable point for a photograph of the church, as will speedily appear. The day of our visit was quite foggy, and that of a yellowish hue; but there was no help for it but to set up the camera in Seething Lane, a polite police-sergeant having told us there was no objection if we did not obstruct the street. Well, *we* did not obstruct the street, but in less than five minutes the street *was obstructed* by a mob of perhaps fifty men and boys, who seemed to have sprung out of the ground for no other purpose than to vex us. Forming in line across the front of the camera, they put themselves into the most grotesque and ludicrous attitudes, embellished with expressive pantomime, highly flavoured remarks, and roars of laughter. It was as good fun for them, no doubt, as bear-baiting for their forefathers, if they ever had any.

Expostulation being of no avail, we tried the plan of lighting a pipe and sitting on the curb until they saw fit to leave, but it was a failure, for they lit their pipes and waited also. It has been a source of great regret since, that, instead of packing up the camera as we did, and leaving in disgust, we had not exposed half-a-dozen plates upon this crowd of London toughs, but the chance is gone. Finally, by good luck, the manager of the spice mill allowed us to take a view from a rear window, the view showing part of the graveyard, the south aisle, and part of the nave of the church. I do not think a satisfactory view of the entire exterior could be made, except from an elevated platform or a camera on stilts.

The interior of the old church afforded a great contrast to the annoying scene outside. It was very quiet, and the light was dim within its walls. True, there was one party, I think from the Czar's Head, who insisted upon telling me his family history, but he finally went to sleep in a corner of a pew; and also a gentleman who asked me many questions, showing that he knew something of photography, but, when I told him I was giving ten seconds' exposure with next to the largest opening of the lens, he lifted up his eyes and departed.

So I was at last in peace, with all the memories of the old church crowded upon me. Here William Penn, the Quaker, the founder of our great state of Pennsylvania, was christened in 1644, and we were fortunate enough to secure a view of the top of the font and of the beautiful carved cover and ancient iron bracket supporting it. Just beyond the font can be seen part of an altar tomb, which cannot be identified, but its date is said to be not later than 1500. In the north-east corner of the chancel is a fairly well-preserved altar tomb, believed to be that of Alderman John Croke and family, about 1477. It must in its time have been a very fine memorial, but it is defaced, like many of the memorial brasses, by the chisels and hammers of the Puritan zealots.

The pulpit and the interior fittings of the church are mostly modern (about Queen Anne's time), but very substantial, and, for the most part, appropriate. At the altar was married John Quincy Adams, one of the Presidents of the United States, and over the corporation pew are still to

be seen the sword rests of iron grille work, with heraldic devices, in honour of the three Lord Mayors who were residents of the parish, the one to Sir John Eyles dating in 1727.

From its nearness to the Tower, many illustrious victims of its procedure have been buried here. The list is too long even to abbreviate, but among them may be named Archbishop Laud, Henry Howard, Earl of Surrey, Lord Thomas Grey, and many others. Space forbids us to speak of the fine brasses, that of 'Andrewe Avyngar, of London, and Ellyn his wyff,' being particularly interesting and fine, and unsurpassed by only one Flemish brass in England.

This is one of the seven or eight parish churches that escaped destruction in the great fire of London, and it is said that to its ancient spire (now replaced by a most hideous modern one) the delightful diarist, Pepys, came to witness the spread of the conflagration. In short, good judges say it is the finest mediæval church extant in London, and, as an American tourist, I can truthfully say I folded up my camera and left it with great regret. What a pity it is that the accomplished amateurs of London do not pay more attention to the memorials of the history of their city which are vanishing so fast.

My acknowledgments are due to the Vicar of the parish and to the pamphlet (an abridgment of a larger and exhaustive work) published by the Rev. Joseph Maskell, formerly Curate of All Hallows', Barking, copies of which may, no doubt, still be obtained at the church.

A PHOTOGRAPHER, SOME DEALERS, AND ALL MANUFACTURERS.

By J. Vincent Elsden, B.Sc.

Some recent experiences, probably by no means peculiar to myself, have suggested the above title to this small contribution to the Almanac.

Having run short of materials during a summer holiday, I purchased, from a provincial dealer, some dry plates, as well as some films for a hand camera. The former were a well-known brand of the highest repute, the latter were the only brand suited to the purpose.

The results, on developing the plates, did not please me, and on sending the batch number to the makers, I found them to be five years old. The films were evidently of a similar, if not greater, antiquity.

The result was the loss of a few dozen valuable exposures, simply through a misplaced confidence in the assurances of the middleman.

Now, all this could be easily avoided if the manufacturers, instead of marking each packet with a batch number, intelligible only to themselves, would state the date of preparation of the emulsion. Of course, this plan would render the disposal of "shopkeepers" difficult, but surely it would pay the manufacturer to take these back in exchange, rather than risk the loss of reputation involved in their being palmed off upon the unwary.

I am well aware that no experienced photographer would ever get his materials otherwise than from headquarters, except under the direst necessity, but this is not as it should be, and I cannot but think that the dealer would find his business increasing if he were able to guarantee the condition of his goods.

GELATINE *VERSUS* COLLODION NEGATIVES.

By Charles Allan Ferneley.

The question has often been discussed as to whether the old iron developed collodion negatives were superior to those now produced by gelatine, and that better results could be obtained on collodion in a weak and dull light. I have found, that with a good make of fairly rapid plates, with a fair amount of bromide, full exposure, and pyro developer, very fine results can be obtained in dull weather, more especially in architecture where, if taken in extreme sunlight, the exquisite fine details would be lost.

I have been taking a series of negatives this year of Lincoln and York Minster, and on each occasion had a dull light, in some cases found it difficult to focus. I however obtained some negatives with extremely fine detail and printing power, more especially the Lincoln Doorways, viz., South Decorated, Last Judgment; Entrance to Cloister, Perpendicular and Lancet, Western Anglo-Norman one of the finest in existence, with its dog-tooth moulding and chiselled scroll-work.

If we examine carefully an old collodion negative developed with pyro, and an early one in gelatine developed with pyro, we shall find a great similarity in both; if by reflected light, a uniform brown tint will pervade the plate showing neither lights nor shadows, and by transmitted light relative value of light and shade will be seen, but still brown veilings in shadows.

In printing collodion negatives as above, eighty or ninety grain silver bath would be required, and would take several hours to print in sunshine. With the advent of iron development, a great advancement took place in collodion negatives, the high lights being nearly opaque of a brown tint, sometimes a brown-black, the shadow being clear or only slightly veiled. The negatives were quick printers, and sensitising bath from forty to sixty grain silver per ounce. The prints from a high class negative would be extremely fine and juicy with plenty of sparkle.

If we refer back and look at the works of Scotch scenery by the late G. W. Wilson, Aberdeen, England, International Exhibition, 1862, and Swiss subjects, F. Bedford, English scenery, F. York, London, and Zoological series, we should be well repaid to see again what was done in old collodion days.

At the present time we can make excellent prints from old negatives by carbon double transfer, bromide, gelatino-chloride, transparencies, and last, but not least, platinotype, as regards permanance.

When at the platinotype stall of the photographic exhibition, Crystal Palace, in or about 1888, I was struck by the beauty of prints of the House of Parliament—20 × 15—and on mentioning to the operator that I had seen a silver print from it at F. Ayling's, architectural photographer, New Oxford Street, in 1866, he showed me the negative and informed me that it was one of the finest he had used for platinotype. The negative was full of brilliancy and printing power.

For landscape and general work I am under deep impression that pyro and ammonia give the best value, tone, and power to negatives, varying bromide restrainer according to time of year and subject.

EPITOME OF PROGRESS IN 1897.

COMPILED BY THE EDITOR.

STRENGTH OF HYPO SOLUTION AND TIME OF IMMERSION FOR FIXING ALBUMENISED PAPER.

CONVENTION GRANT PAPER BY A. HADDON AND F. B. GRUNDY.

THE permanence of prints on albumenised paper and their freedom from yellowness with age undoubtedly depend on the elimination, by the fixing bath, of the insoluble salts of silver. Up to the present we have not been able, by means of hypo alone or with the addition of other salts, to reduce the quantity of silver left after fixation below a certain small percentage, and it is this small quantity of silver that ultimately causes the high lights to turn yellow, and finally the print to materially change in colour.

Our standard works on photography lead us to infer, since no mention is made of it, that hypo is capable of removing the whole of the silver from the high lights of a print on albumenised paper, and the usual recommendation with regard to fixing is to make up a twenty per cent. solution of hypo and immerse the print in it. The volume of such a solution that we ought to take for a given area of paper is, in almost all cases, left to the judgment of the operator.

The only mention of the quantity of hypo required for fixing paper that we have come across is given in *The Art and Practice of Silver Printing*, by H. P. Robinson and Captain Abney, page 93, where it is said that one ounce of hypo will fix with safety three sheets of paper. It is quite possible that one ounce will do this; but, if we have to take a twenty per cent. solution, using one ounce of the salt, we should have five ounces of the solution only in which to immerse our three sheets of paper—rather a small volume—unless we fix the paper in batches of half or whole sheets, which would make it a tedious operation.

We have some difficulty in discovering the origin of the usual recommendation to fix albumenised paper in a twenty per cent. solution of hypo for fifteen minutes, but finally found a recommendation very much like this in the classic research of Messrs. Davanne and Girard, published in vols. iii. and iv. of the *Photographic News*, 1859 and 1860. They recommend a solution of from fifteen to twenty per cent. of hypo, and time of immersion from ten to fifteen minutes.

We will quote their own words: 'Our experiments were made upon solutions five, ten, fifteen, and twenty per cent. This last strength appeared to give the best results, and we stopped at it, although there was nothing absolute in it; it is a medium strength, and may be diminished or augmented without any inconvenience.'

Further on they say: 'In every experiment we have made we have found that, after an immersion in the hypo bath of ten minutes, the proofs obtained

in the ordinary way, even without previous washing in pure water, were completely fixed; it is, therefore, only in exceptional cases, as in employing excessively thick paper, of concentrated baths of soluble chloride, or of nitrate of silver, that we must consider how long it will be advisable to prolong the fixing, which, as observed by Mr. Le Gray, should be as brief as possible.'

From the above it will be gathered that in 1860, in many cases, the paper on removal from the printing frame was transferred directly to the hypo solution, and with this method it was not astonishing to find that some silver was left in the paper. We must also bear in mind that albumenised paper of those days was feebly albumenised, highly salted, and not toned before fixation. Messrs. Davanne and Girard, seeing the possibility in certain cases, when the paper was not washed before fixation, of the formation of insoluble salts of silver due to the excess of silver coming into contact with the hypo, recommended that the fixing solution should be compounded as follows:—

Hypo	100 grammes.
Common salt	25 ,,
Bicarbonate of soda	10 ,,
Water	500 c. c.

Here we have definitely laid down twenty per cent. The addition of the chloride of sodium was to prevent or retard the formation of the insoluble thiosulphite of silver and sodium, and, to prevent the solution becoming acid, bicarbonate of soda entered into the composition of the fixing bath. When the intermediate washing took place between the printing and fixing, a weaker bath was recommended, and depending on the thickness of paper, the time should be varied from ten to fifteen minutes.

The quantity of silver per sheet in the paper after washing was found to be 1·3686 grammes by the same gentlemen. The maximum we have been able to obtain from modern papers is ·3186 grammes of silver per sheet. From this we may naturally conclude that most probably the images produced on these highly salted papers were mainly silver reduced from the chloride, and not from the organic salt of silver. On modern papers, on the contrary, the image is formed mainly by the action of light on the organic salt of silver.

In the experiments we have recently made, in order that the results may be comparable, we have always used the same amount of hypo per sheet of paper, whatever the dilution or concentration of the solution, and from some preliminary analyses we found that the silver was reduced to a minimum, other conditions being constant, when the hypo was made alkaline with ammonia. The quantity added was 4 c. c. to each litre of solution (about 1 drachm per 40 ounces).

It might seem at first sight that the dilution of the hypo would have little influence on its power of dissolving chloride of silver provided there was sufficient of it present, but this is not so; a one per cent. solution of hypo, when allowed to act for fifteen minutes, left in the paper 33·5 per cent. of the silver. In all cases, excepting where otherwise stated, we have compared the silver left in the paper after fixing and washing with the silver which mere washing in water was unable to remove.

As our analyses led us to the conclusion that no practical results could be hoped for by using very dilute solutions of hypo, we need not trouble with them.

The fixing bath recommended by Messrs. Davanne and Girard, and which we have already given, failed to remove more silver than does ordinary hypo.

A ten per cent. solution of hypo for ten minutes, followed by another of forty-six per cent. for five minutes, produced no better result.

We have made over forty analyses of papers fixed in different ways; the most interesting results we have obtained are shown in the following table. The different figures give the quantity of silver in grammes per sheet left in

the paper with four baths of different strengths, and the paper being left in these solutions for periods varying from five to twenty minutes.

Percentage of Hypo.	Time of Fixation in Minutes.			
	5	10	15	20
5	·0160 ·247	·0200 ·308	·0200 ·308	·0180 grammes. ·278 grains.
10	·0140 ·216	·0142 ·219	·0160 ·247	·0140 grammes. ·216 grains.
15	·0160 ·247	·0188 ·290	·0180 ·278	·0200 grammes. ·308 grains.
20	·0200 ·308	·0180 ·278	·0180 ·278	— grammes. — grains.

This table reveals one curious fact, which could only be arrived at by analysis, that is, that below and above a certain strength of hypo more silver is left in the paper than when using that particular strength.

A ten per cent. solution of hypo, in from five to ten minutes, removes more silver from paper than does a stronger solution in the same time.

This is fortunate, as by using hypo of this strength there is less danger of the delicate half-tones of a print being dissolved than would be the case if the strength of the solution were doubled. The quantities of silver left in the different pieces of paper vary, but this is due to two causes, most probably experimental error and inequality in the thickness of the layer of albumen on the paper.

Messrs. Davanne and Girard, in their paper, say that a fifteen or twenty per cent. solution of hypo, when allowed to act for ten minutes, completely fixed the proofs. It is very unfortunate that they did not give the method they adopted in order to arrive at this result.

We have experimented with two different brands of paper, and the amount of silver left in one is ·0148 grammes per sheet, and in the other ·0145 grammes. It must be perfectly clear to every one that, if the complete elimination of silver from the high lights of a print is the main condition for its permanence, then that paper which retains most silver when we have fixed and washed must of necessity be the least permanent. This also points to the fact that the preparation of the albumen or its purity has some effect on the amount of silver finally left in the paper.

In the early days of photography pure fresh egg albumen was used, but now frequently, in order to obtain extra gloss, the albumen is allowed to partly decompose before it is coated; sulphur compounds may thus be formed, which combine with the silver and are insoluble in hypo.

We thought it would be instructive to experiment with albumenised paper made some twenty years ago. We were fortunate in obtaining a couple of sheets from Messrs. Atkinson & Co., of Greenwich. The total silver in this was found to be per sheet ·6172 grammes, and silver left after fixing ·0123, less than in modern papers.

In conclusion, we have confidence in recommending that papers (albumenised) should be fixed in ten per cent. hypo made alkaline with ammonia in the proportion mentioned above, and that the fixing, unless the paper be unusually thick, be not continued beyond ten minutes.

The sensitising of the paper and the method of analysing for the estimation of silver we have already given in previous papers.

THE BICHROMATED GUM PROCESS.

THE following excellent *résumé* of this process is due to Mr. George Ewing:—

However extravagantly photographic 'artists' may rage, and the supporters of the *Salon* imagine a vain thing, much will be forgiven them for bringing to general notice the great capabilities of the bichromated gum process of direct pigment printing. Though that process has long been known—it has been in use, it is said, at the Vienna Military Institute for over forty years—it was well-nigh forgotten, and would probably have been as dead as Julius Cæsar in another lustrum had not Mr. Maskell redirected general attention to it by his exhibits at the Salon of 1893. Thereafter, one of the first to apply himself to a systematic study of the subject was M. Rouillé-Ladevèze, who, on March 14, 1894, read before the Photographic Club of Paris a memorandum giving full details of the process. But the monograph, excellent though it was, would not have availed much if it had not been supported by visible proofs of the charming pictures obtainable by a close adherence to the instructions therein given. These, however, were so far superior to anything till then seen that many of Rouillé-Ladevèze's compatriots were induced to follow him, and they were soon followed by those of other lands who longed for liberty of artistic expression unfettered by material restrictions, until, within a few months from the publication of the memorandum, the Exhibitions of London, Paris, Brussels, and Vienna showed pictures produced by the bichromated gum process that as much charmed artists as they put profane scoffers to utter confusion. Since then, studied and practised by zealous seekers after the beautiful, the process has made steady progress; and, if to-day it has not quite attained perfection, or if there still remain things unknown, the matchless results already obtained clearly indicate it as the printing process of the future. Foremost amongst those who have steadfastly laboured for its perfection may be placed three members of the Vienna Camera Club, Messrs. Watzek, Henneberg, and H. Kuhn. These gentlemen have verified, corrected, and completed the observations of Rouillé-Ladevèze, and have published the result of their investigations in the *Wiener Photographische Blatter* (Nos. 4, 7, and 10 of 1896). As their articles should save novices many fruitless trials and discouraging failures, the following *précis* will, no doubt, prove useful.

Paper.—Any close-grained, well-sized paper will answer, though Messrs. Henneberg and Kuhn recommend specially the drawing and water-colour papers prepared by Schleicher and Schull, and the 'Montgolfier' paper prescribed by Mr. Demachy This latter can be had either in white or in cream, and other warm tints, and, when the grain is close, gives most brilliant prints. More open-grained papers, Mr. Watzek says, retain the colour better, and give half-tones more easily; but Messrs. Heneberg and Kuhn assert that the rough English makes do not give pure white.

Sizing.—Whatever paper be employed, it will be advisable to size it. For this purpose starch or flour may be used, two to four parts of starch being taken to a hundred parts of water, according as the surface of the paper is more or less rough. Dr. Just, of Vienna, sells nine varieties of paper ready-sized for coating.

Colours.—The quality of the colours used is of the first importance, and our authors are particular in recommending certain manufacturers. Watzek suggests the use of pigments manufactured by either Winsor & Newton, of

London; Schmincke, of Düsseldorf; or Paillard, of Paris; but finely ground pigments of other makers will, no doubt, serve equally well. All colours are not suitable. Blacks, whether animal, ivory, or lamp-black, give the best results; blues, particularly Prussian blue, ultramarine, or indigo, are nearly as good; but browns are exceedingly difficult to work. Besides the blacks and blues named, burnt sienna and English red may be used; other colours had best be left alone.

Character of Negatives.—For the best results, transparent and soft, but by no means weak, negatives should be used. The style of negatives that give good enlargements is what is required. It is possible, however, by varying the proportion of gum and pigment, to obtain very successful prints from negatives of any character. Dr. Henneberg and Kuhn state that, by using burnt sienna, they have succeeded in securing excellent pictures from negatives that were too harsh for ordinary printing-out paper; and they lay down as a genera principle that, the more gum used, the more pronounced the gradation of tones and that an increase in the quantity of colour tends to softness.

Gum.—The gum to be used is the ordinary gum arabic sold by stationers for office use. Mr. Watzek prefers to use a ten per cent. solution, with the addition of a few drops of phenic acid as a preservative; but Messrs. Henneberg aud Kuhn recommend a solution containing equal parts by weight of gum and water, without any preservative. Their experiments having shown that the longer the gum solution is kept the more sensitive it becomes, they prefer to let the solution stand till it becomes mouldy, and to then filter it for use. In this state it will keep for a long time without deterioration.

Coating the Paper.—The sensitive coating is prepared by pouring into a graduated glass measure, in equal quantities, first the gum solution, then the pigment, and lastly a ten per cent. solution of bichromate of potash, and mixing them *thoroughly*. It is advisable at this stage to test the quality of the mixture by coating thinly with it a small strip of waste paper. After drying, the surface should show the dull lustre of the crude gum. The brilliancy or otherwise of the coating is, in fact of the highest importance; for, if the layer is too brilliant, it indicates that there is too much gum, which will disappear with its contained colour in the subsequent operations, and, if the coating is very dull, the shadows of the picture will be choked. Between these two extremes a variety of changes can be rung, to suit the subjects to be depicted. As on the quantity of gum depends the grain of the image, a sufficiently large proportion should be used for landscape to secure brilliancy, and a correspondingly small quantity should be employed for portraits. In this matter each photographer must work out his own salvation. The right proportions of the constituents having been settled, the paper selected for printing is coated, in yellow light, with a thin layer of the mixture. For the purpose use a large and broad brush fully charged with the sensitive gum solution, but be careful to avoid all brush marks or other unevenness, and to lay on the coating so thinly as to permit of the underlying paper being seen When the ground has been laid, go over it with a badger's-hair softener or broad camel's-hair brush, so as to ensure a perfectly even coating, for on this depends success or failure. The coating having been satisfactorily distributed, the paper is to be dried quickly over a stove. It is essential that the paper be absolutely dry, otherwise the colour will dissolve in washing; but care should be taken to avoid scorching, as that would produce indelible marks.

Printing.—Paper prepared as directed may be kept for a few days, but it is always advisable to use it as fresh as possible, preferably immediately after sensitising. At this stage the technical skill of the worker will have most occasion for display, since good results are obtainable only from correct exposure, and the length of exposure depends on the quantity of gum in the coating—more gum more printing. As the light impression is not visible till after development, the depth of printing has to be judged by a photometer,

Any one of the photometers commonly used for carbon work will do, though our authors employ Fernande's, and find that the blue-black tints require from 3° to 4° on that instrument (*i.e.*, about two minutes in sunlight), black colours from 4° to 6°, and brownish yellows about 10°. Mr. Watzek says, however, that the exposure, on a fine winter day and with a soft negative, should range from a quarter to half an hour, the difference depending on the colour of the prints and the quantity of the bichromated gum in the film.

Development.—After printing, the paper is immersed in a dish of pure cold water, which is changed every few minutes, until it ceases to show any trace of yellow caused by the bichromate in the coating. Once the bichromate has been eliminated, the further operations can be comfortably carried out in daylight. If, now, the exposure has been correct, the outlines of the image will soon show themselves at the points of greatest contrast, and the highest lights will appear in the cold water. Rock the tray for about five minutes, and then add a small quantity of tepid water of about 70° F., increasing the temperature from time to time till the image commences to appear. Now carefully lift the print on to a sheet of glass, cautiously avoiding contact with the surface, and, holding it over the basin, keep pouring water on the picture. If the exposure has been too short, development will soon be completed, but the image will be weak. Over-exposure, on the other hand, will cause the image to hold back, and in that case recourse may be had to the sawdust soup recommended by Artigue to bring out details. Finally, replace the print under water, and, by means of a soft and fine brush, remove the parts that offer the greatest resistance, clearing up the portions that appear too dark and eliminating useless detail. Proceed, however, with the utmost caution so as to avoid marks, and do not allow the passion for 'artistic' results to annihilate photographic excellence.

After Operations.—Development having been completed, the print is immersed in a ten per cent. alum solution, to remove the last traces of bichromate, and, after thorough washing in cold water, is dried. It should then be varnished with any good crystal varnish, as that gives depth and transparency to the colours, particularly to those, like umber and burnt sienna, that have a tendency to appear too deep.

Final Remarks.—Printing in clouds from a second negative is not possible unless, after development, the sky portion is resensitised, printed on, and redeveloped. By this second sensitising, however, effects in two colours may be produced. Certain authors recommend the use of soda and acids in development, but Kuhn is distinctly opposed to their use, as they diminish the intensity of the shadows.

HERR HUGO HENNEBERG gives the result of his experiences in the working of the process.

The conclusion to which Herr Henneberg has come is that, for the successful working of the process, the most important factor is the amount of gum which is laid on the paper, and he says that hitherto either too much or too little gum has been used, the coating has been too thin, it was printed too much, and the water used was too hot. He has found that prints which have only been exposed for a short time and developed in cool water, when a plentiful quantity of gum has been used, are much more 'piquant' and fresh than those with which a little gum was used and over-printing and hot water were employed.

His advice as regards the materials is, of course, based on Continenta forms, and it might be difficult therefore to obtain some of the materials which he suggests.

THE PAPER.

Well-sized paper is the best that can be used, and, of the smoother papers, those of Causon & Montgolfier, the drawing paper of Schleicher & Schüll

for coarser-grained papers, No. 751 of the latter firm and the water-colour paper of Johannot & Co., of Annonay are the best; the drawing papers, as used for platinotype printing, especially Whatman's paper, are totally unsuitable.

The Chemicals.

The solution of gum arabic should be forty per cent., its quality is not of the greatest importance; the solution of potassium bichromate should be absolutely saturated. When this process was first used, considerable importance was laid on the quality of the colouring matters, but Herr Henneberg finds that this has little effect; the water, paste, and tempera colours, powders, powdered drawing chalk, lamp-black, and many others may be used with equally good results. Herr Kühn recommends also fatty colours, soft Conté crayons, pastel colours, and especially drawing chalks. As a rule, a colour is better and gives softer prints the richer it is and the finer the powder. By comparative experiments, Henneberg states that the colours as generally used are absolutely unchanged in shade by the addition of the bichromate.

It is difficult to make exact statements as to the proportion of the three ingredients. For a sheet 50×60 cm. Henneberg uses $1\frac{1}{2}-2$ g. of colour, $6-8$ c. c. of gum solution, and this mixture is diluted according to the thickness of the coating with from 15 to 25 c. c. of solution of potassium bichromate. One tip, which may help as to the suitability of a paper and a proper quantity of gum, is the following: a piece of the dried and unexposed paper must part with the whole of its pigment, when laid in cold water for half an hour. If this is not the case, too little gum has been used. If a faint tinge of colour remains on the white unexposed edges or rebates of the prints. the paper is not suitable; it is too fibrous.

Spreading the Colour.

Of considerable importance and, next to the development, the most important factor, is the correct spreading of the colour, not so much as regards its regularity, but in respect to the tonality of the surface and the white paper. Obviously, if one considers as to what the final picture is to be as with the other processes, a correct coating is all-important, whilst with other processes the depth of the picture in the deepest shadows is dependent on the length of exposure, and therefore the greater or less decomposition, that is to say, the separation of more or less metal (silver or platinum); in the bichromated gum process the deepest shadows are determined beforehand. The whole character and tonality of a picture, whether one wants a vigorous, plucky picture with deep shadows, or one with soft gradation, depends, in this case, not on the character of the negative or the exposure, but solely on the original intensity of the colour on the paper. It is, therefore, says Henneberg, one of the requirements of a bichromated gum picture that exactly so much colour, and no more, should be spread on the paper as should be present in the deepest shadows of the picture, and therefore the amount of raw pigment spread on the paper must be proportioned in every case to the effect which it is desired to attain. Thus, if it is desired to print a vigorous, plucky landscape, such as a country scene, and a delicate head study, the same sheet of paper cannot be used, which is totally different to platinotype paper. In the deepest shadows the whole of the gum must become insoluble, and in development no colour should be dissolved away; if, however, excessive colour is present on the paper and in the deepest shadows, the development must be prolonged in order to remove the excessive colouring matter in the shadows, so that the high lights and half-tones may be washed away.

The peculiar peeling of the colour in development, which has frequently

been complained of, is, according to Henneberg, due to the thickness of the film rather than the quality of the colouring matter. It appears generally when too thick films are used or with under-exposure; that this flaking or peeling is more noticeable with brown films is due to the fact that these require the longest time to print. The thinner the film is, the more gum it will stand.

Printing.

From what has been said above, it will be seen that Herr Henneberg lays less stress upon the printing than is usual in other processes, and he considers that the method of development is more important, but considers that it is advisable to use an actinomter, especially when it is not possible to see the image. As a sign of correct printing, Henneberg considers that the high lights should be distinctly visible, without any adventitious aid, after half an hour's soaking in cold water; and he says that no aid to development should be used till all the chromium salts are washed out. If the high lights are visible only after the use of hot water or some other developing agent, the print was over-exposed. Under-exposure is recognised by the film dissolving too readily.

As a rule, thin and soft negatives are to be preferred, but this does not mean that good effects cannot be obtained sometimes from hard negatives; but it is important that the shadows of the negatives should be quite clear, as good results are never to be obtained from flat and foggy negatives.

Development.

The development Henneberg states to be the whole secret of the process, as by judicious use of various agents any effect desired can be obtained. He uses a common scent-spray diffuser, which is placed in an ordinary bottle. which is held in the left hand, whilst the right hand is used to operate the indiarubber bellows, which should be fitted with two indiarubber balls, so as to give a continuous stream of liquid. By bringing this into play at the correct moment, increasing or reducing the distance between the spray diffuser and the print, and the use of cold, lukewarm, or hot water, any effect can be obtained, and it is particularly suitable to clear up dark parts of the picture.

Combination Printing.

Henneberg's prints by this process in the last Salon were noticeable for the clouds, which he had obviously printed in, and he explains how this was done. He states that he discovered that, after one of these bichromated-gum prints had been developed and dried, it adhered very firmly to its support, and that therefore it could be again treated with hot water, brush, or spray, without suffering change. It is thus possible to develop a print and obtain a perfectly white sky, and to dry the same, and then coat it afresh with the pigmented gum and expose afresh under a cloud negative, and then to develop this till the desired result is obtained.

CARAMELENE FOR BACKING PLATES.

An interesting paper on this subject was read before the London and Provincial Photographic Association by Mr. Haddon, in the course of which he observed :—

If we refer to Watts's *Dictionary of Chemistry*, we find caramel, as usually prepared, to consist of three distinct substances: caramelane, caramelene, and caramelin. Caramelane is soluble in alcohol of 84 per cent. and in water. Caramelene is insoluble in alcohol of 84 per cent., but soluble in weaker spirits and also in water. Caramelin is insoluble in water and

alcohol, but soluble in weak spirit. These substances differ from each other, and from sugar only in that they contain less hydrogen and oxygen constitutionally. The sugar, by the application of heat up to about 190° C., is dehydrated to such an extent as to form the first substance, caramelane, soluble in alcohol of 84 per cent. and in water ; if, now the temperature be raised to about 220° C., this body loses still more of the elements of water and is converted into caramelene.

Caramelane has but small colouring power, and besides is hygroscopic ; caramelene, on the contrary, is very highly coloured, and possesses, it is said, six times the colouring power of caramelane, and is but slightly hygroscopic. When producing caramel for photographic purposes, we should aim at producing that variety which is as highly coloured as possible, and which absorbs the minimum of water from the air. It is for this reason that, in cooking the sugar, it is necessary to urge the temperature to such a degree as to convert as much as possible of the caramelane into caramelene, but at the same time avoiding such high temperatures as will produce the insoluble variety, caramelin.

In order to produce the caramel from which the caramelene is obtained, proceed as follows :—Place in a capacious stewpan, say, one pound of loaf sugar (moist sugar will not do), and rest the whole on a clear fire, or, better, on a gas stove. As soon as the sugar begins to melt, stir it with an iron spoon, and, till the cooking is complete, the stirring must be continued, or the sugar may be charred locally. Until the whole of the sugar is melted there will be no great rise in temperature and the volume will be small, but soon after complete fusion the temperature will begin to rise, and abundance of bubbles will be formed, so as to fill almost completely the stewpan, unless it be a very capacious one indeed. Judging roughly, I should say that the volume increases to five or six times that of the fused sugar. After a few minutes the frothing will gradually subside, and the effect of the continued heat will simply cause the mass to boil, but without any very considerable increase in volume. At this stage the caramel is very fluid, of a light red colour by transmitted light, and the bubbles rise easily to the surface. The temperature is now about 220° C., and this temperature should be maintained for about fifteen minutes ; at the end of that time the fused mass begins to thicken, and the cooking should not be continued more than four or five minutes after this stage, as, if it is, there is danger of the whole mass being converted into the insoluble variety, and time and material will be wasted. It would be best, perhaps, for a beginner to operate on a smaller quantity of sugar as a first trial, so as to study the different changes, and, when a satisfactory sample can be produced, then to repeat the cooking on a larger scale.

As soon as the caramel has passed through the various stages, pour out the contents of the stewpan on a piece of cold metal or on a slab of slate or marble. If sheet metal is used, the caramel will be found, as it cools, to detach itself in pieces from the support. If the operation of cooking has been properly carried out, when cold it will be brittle and free from tackiness.

The caramel should now be broken into small pieces and placed in a wide-mouthed bottle, and sufficient water added to cover about one-third the height of the caramel. If the bottle be set aside for a few days, the solid will have dissolved, and we shall have a thick, treacly mass of caramel dissolved in water. This solution contains both caramelane and caramelin. The next operation is to separate the one from the other. As I have already stated, caramelane is soluble in alcohol of 84 per cent. (sp. gr. ·84) ; if, therefore, the aqueous solution be poured into strong alcohol, the caramelane will remain in solution, and the caramelin will be precipitated. Ordinary methylated alcohol, of sp. gr. ·820, will do quite well, and eight to ten times the volume of the syrup should be used in order to effect the separation. If the alcohol is of the

proper strength, the alcoholic solution ought not to be very deeply coloured, and a large, soft lump of caramelene should be found at the bottom of the precipitating vessel at the end of about an hour. When the solution is first mixed with the alcohol, it becomes of a brownish colour, due to the precipitation of the insoluble caramelene.

After draining off the supernatant liquor, water is added in sufficient quantity to form a tolerably fluid mixture. If this be used by itself to back plates, it will frequently be found on drying to flake off the glass. This defect can be avoided by adding from one-eighth to one-tenth volume of the original caramel solution. In this way a mixture is obtained which will both dry hard and remain firmly attached to the plate when dry.

In order to apply it to the plates, pour a small quantity into a saucer, and then allow a piece of absorbent wool to become partly saturated with it, and pass the wool over the backs of the plates till they are evenly coated. Only a thin coating is required for ordinary work ; but, if a difficult subject is to be photographed, then it is better to apply the caramel with a brush, so as to leave a thicker layer on the plate.

So as to cause the caramel to dry quickly on the backs of the plates, instead of dissolving the caramelene in plain water, dissolve it in spirit and water, in the proportion of one of the former to three of the latter. Caramel thus prepared will dry, when the thickness is not excessive, in about thirty minutes.

The methylated spirit, as now sold, is not the most suitable for the precipitation, as, in consequence of the oil separating on dilution, the film dries with some patches more or less bare, caused by the repellent action of the oil. The old methylated spirit, however, does not produce this effect.

Some workers recommend the addition of burnt sienna or other insoluble body to the caramel ; but this, I think, is a mistake. If plain caramel is used, the plate can be transferred direct to the developing solution, and without any danger of pinholes being formed, due to particles of insoluble matter adhering to the film, and so preventing the full action of the developer. The solution of the caramel in the developer has no detrimental action on the image.

The colour of caramelene is very non-actinic, so that, if at any time I could not obtain glass or other material with which to filter white light for development, I should not hesitate to trust to the light which comes through paper or linen coated with caramel.

BAS-RELIEF PHOTOGRAPHY.

MARTIN'S METHOD.

THIS method is described by the inventor in the following terms : He first makes a negative in the usual way. On the film side, and near the corners of this negative, he attaches wafers of opaque paper cut out by means of a steel punch. The wafers are placed as far away as practicable from the centre of the picture, in order that they may be out of the way, and covered when the picture is mounted. The back of a sheet of sensitised paper, preferably that known as rapid bromide, is placed in contact with the negative in a printing frame, and a reversed image of the picture obtained by exposure in the usual way. Images of the wafers will appear with the image of the picture. The reversed image thus obtained is mounted upon a block or piece of wood about half an inch in thickness. When dry, the outline of that part of the figure which it is desired to emboss is carefully traced over with a lead pencil, and the block is then pierced through with a fret-saw, following such pencil lines, thus leaving a perforation, the boundary of which will coincide with the outline of the figure. A finished positive print is now made from the negative, and

mounted upon thin sheet brass, copper, zinc, or other ductile material, and, when dry, the portions covered by the images of the wafers are cut out by the steel punch. This perforated positive picture is then laid face downwards upon the reversed image, or such parts of the reversed image as are left upon the pierced block, care being taken that the perforations exactly correspond with the images of the wafers on the block.

A pad of thick sheet indiarubber or wadding is now placed upon the metal backing of the positive picture, and the whole subjected to pressure under a press; an ordinary copying press is admirably suitable for the purpose.

On removing the picture from the press, it will be found that the parts extending over the perforation in the block have been pressed forwards in the perforation, and have assumed a pleasing general bas-relief effect.

To model the more delicate details, the picture still in contact with the pierced block is placed in a vice, or otherwise held firmly, to leave the artist's hands at liberty to work on either or both sides of the picture, and so that he may gently depress from the front such parts as are required, and press forward from the back such other parts as he may desire. For this work pencils, preferably of soft wood shaped to suit the requirements, may be employed; but, f the fingers are used, soft leather or kid gloves, or finger stalls, should be worn, in order that the picture may not be marked.

If thought desirable, the indented portion at the back of the picture may be filled with plaster of Paris, or the like, to render it solid, but this is not necessary when the picture is to be protected under glass in a frame.

TABER'S METHOD.

Fig. 1 is a view of a photographic negative with guide or register marks thereon.

Fig. 2 is a back view of the block with the embossing mould and register marks.

Fig. 3 is a view of the photograph with the register marks cut out.

Fig. 4 is a view of the mould with guide or register bars attached thereto.

Mr. Taber states that the usual manner in which he carries on this process is to provide on the negative, shown in fig. 1, the guide or register marks, R R, which may be produced by pasting on the negative strips of paper, or painting the same on the negative with any suitable material, so that they will show upon the sensitised paper on which the prints or photographs are made. The surface of the block to be used as a mould is sensitised, and the reverse of the negative, A, is printed thereon, shown in fig. 2, and marked B, where the picture to be embossed is shown on its surface with the guide or register marks, R R. The embossing mould is now made in accordance with the picture on the block by hand engraving, or any appropriate means to such depth and to such degree of nicety of detail as may be desired. A photograph from the negative, A, is now made, and the same is trimmed so as to bring the register marks, R R, at the edge of the sheet. The photograph C, with the register marks thus trimmed, is placed on the embossing mould so that the register marks of C and the register marks of B will correspond. The photograph C is then fastened to the block D by any appropriate means so that it will retain its position on the block with the figure of the photograph directly coincident with the figure of the embossing mould. The photograph sheet, having preferably been moistened to soften it, a backing of soft and elastic material, such as rubber sponge, is applied to the back of the photograph, and the whole is subjected to pressure, whereby the rubber sponge forces the photograph into conformity with the embossing mould, giving to the surface of the photograph the contour of the mould. If desired, the face of the block B may be provided with guide bars or frame, as shown at D in fig. 4, where they are put on in accordance with the guide or register marks. When a frame of this

Fig. 1.

Fig. 2.

Fig. 3

Fig. 4.

character is used on the face of the mould block, the photographs to be moulded should be trimmed in accordance with the register marks on them, which will make the edges of the photograph prints correspond with the frame D on the mould block, causing the photograph of the figures to correspond with the mould when they are in the frame D.

Good results may be obtained by drawing the outlines to be moulded for a photograph, as shown in fig. 1, on a piece of transparent paper or other like material placed over the same, and transferring the outline thus made to the block B by placing on the block B a piece of carbon paper, and placing over that the tracing of the photograph face down, when, by following the outlines on the tracing paper with a pencil or like instrument, the lines will be transferred to the block through the medium of the carbon paper placed thereon, the guide marks, R R, being preferably placed on the block at the same time.

One of the advantages of this way of carrying on the invention is that it may be applied to any photograph without the necessity of having the negative, or more than one copy of the photograph to make a proper mould to emboss the photograph.

It is manifest that, instead of placing a guide or register mark on the negative, the edge of the negative may be used as the guide or register mark, and be shown on the photograph and on the block in which the mould is made, and serve as a register mark without departing from the nature of my invention.

MARCEAU'S METHOD.

Fig. 1 is a view showing the manner of outlining the picture upon the surface in which the corresponding intaglio is to be produced.

Fig. 2 is a view showing the means for registering the pictures which are to be afterwards thrown up into relief.

Fig. 3 is a vertical section through the mould.

Mr. Marceau first prepares a photographic negative in the usual manner. The pictures are then taken from the negative upon films of sensitised paper, and the outline of those portions which it is designed to show in relief is cut out from one of these sheets, and pasted upon a surface of glass as shown at A.

The paper upon which the pictures are taken is all cut of a certain size, and the negative is marked, so that this paper is always laid in the same position upon the negative for printing each picture. The pictures are therefore all in identically the same relative position upon the paper, and they all correspond with the one from which the outline was cut for the purpose of making the intaglio block.

The exterior portion of the paper from which the outline has been cut now serves as a pattern for the exact registry of each of the pictures which are to be thrown up into relief, and is afterwards used for this purpose, as will be hereafter more fully explained.

The surface, A, upon which the figure is pasted, as previously described, forms one side of a mould, the space between the two sides being sufficient to provide a necessary thickness, and the sides being also connected by edge strips so as to form an enclosure, as shown in fig. 1.

Into this enclosure he pours plaster of Paris or other plastic material which will afterwards set and become hard, filling the space within the mould.

The plastic material flows around the figure which has been pasted upon the glass, and this figure, projecting the thickness of the paper above the surface of the glass, will form a corresponding indentation in the material with which the mould is filled, and which indentation remains after it has set.

The mould is then opened, and the hardened material is taken out, the outline or figure is removed from the face of the plaster if it has adhered thereto, and the perfect outline remains upon the surface.

The surface of the block is now excavated or engraved out in the usual

Fig 1.

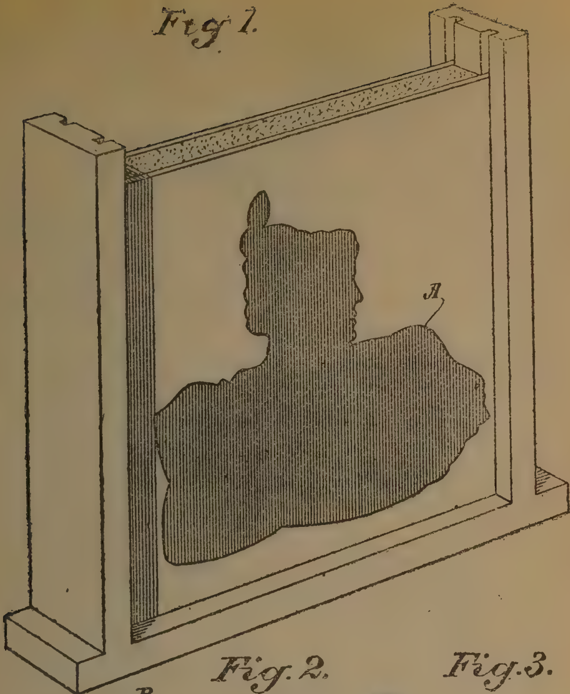


Fig. 2.

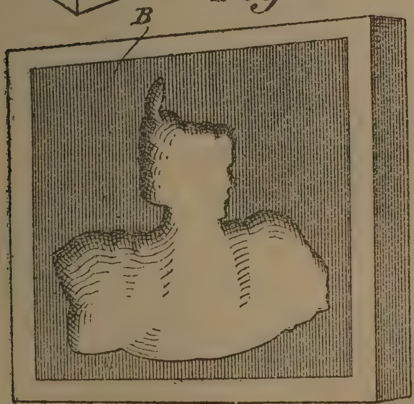


Fig. 3.

manner for producing intaglios, so as to form the various features of the picture to greater or less depth, as the shade or contour of the picture demands and the taste of the artist shows to be proper.

When this is completed, it is in readiness to receive the pictures which are to be thrown up into a relief corresponding with the depth of the intaglio which has thus been formed.

The part, B, from which the figure was cut to form the outline upon the block, is now pasted, or otherwise attached, to the block, forming an accurate peripheral outline around the intaglio, and, as all the pictures are in exactly the same relative position upon the printed sheets, it is only necessary to register the edges of each sheet with that upon the block, to register each picture with the intaglio. The picture is wetted, and then pressed into the block by any of the usual or well-known means for producing raised surfaces, and those parts of the picture which are designed to be thrown up into relief will be correspondingly forced into the various depressions of the intaglio in the block, remaining there under pressure until dried, after which they can be removed, and the pictures mounted in any usual or well-known style for mounting such pictures.

If preferred, any suitably prepared block may be used, and the outline within which the engraving or intaglio is to be made may be marked upon the surface of the block, by laying the cut-out figure thereon and outlining it, and afterwards engraving the block.

A convenient method for effecting this is to lay the picture to be produced in relief upon a supplemental sheet, which is properly proportioned to the block, and then to cut the outline of the picture, and at the same time cut through the supplemental sheet beneath, the two sheets being secured together so as to remain in the same relative position until the cut has been completed.

The supplemental sheet may be made of any suitable material. He has found that collodion in thin sheets makes a very satisfactory substance for the purpose, but it will be manifest that other materials may be used without departing from my invention. This supplemental sheet is then laid upon the block, to which it is temporarily fixed by pins or clamps, and the outline which is to be engraved in the block is marked by following the outline of the cut. The sheet may then be removed and the engraving of the block completed. The pictures to be thrown into relief are then fitted to the opening in the supplemental sheet, and the picture and sheet are placed upon the block, the face of the picture coinciding with the intaglio which has been cut in the block, as in fig. 2.

This registration is ensured by passing pins through the holes already made in the supplemental sheet and through the picture, these pins entering the holes previously made in the block, and after this is effected the pressure is applied to throw the picture up into relief by pressing the parts of it into the intaglio in the block.

ROCKWOOD'S METHOD.

A PREREQUISITE for making bas-relief portraits is a hinged double frame as shown in fig. 1. This, which may be called a modelling frame, is all the 'plant' essential to the process, and is an inexpensive affair. The opening for the smaller-size picture should be the size of a trimmed cabinet print; for an 8×10 print the opening should be 7×9. Having the frame, we proceed as follows: 1. Make a brilliant platinum print, preferably from a profile negative lighted *à la* Rembrandt. Now, on a sheet of very transparent paper, such as the paraffin preservers used to protect cabinet pictures, make a careful tracing of the outline and principal features of the print with a *soft* pencil. 2. Mount the platinum print on thick white blotting-paper with Higgins's mountant (this seems to be a mixture of glue and starch, and is admirable for the purpose set forth). Smooth the print down gently into contact, with a roller if you have

one, and then lay it aside under pressure until it is required, a few minutes later. The dampness thus permeates the absorbent base and print, giving both

FIG. 1.

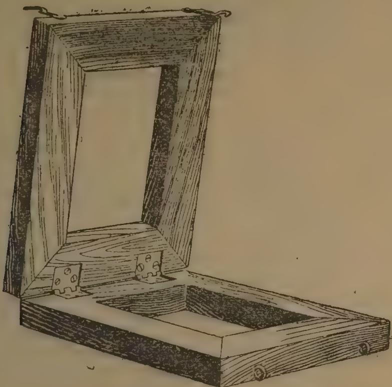
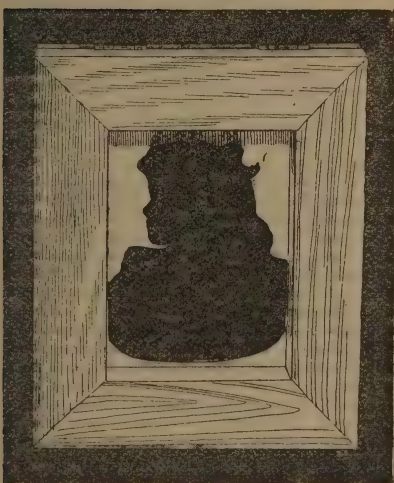


FIG. 2.



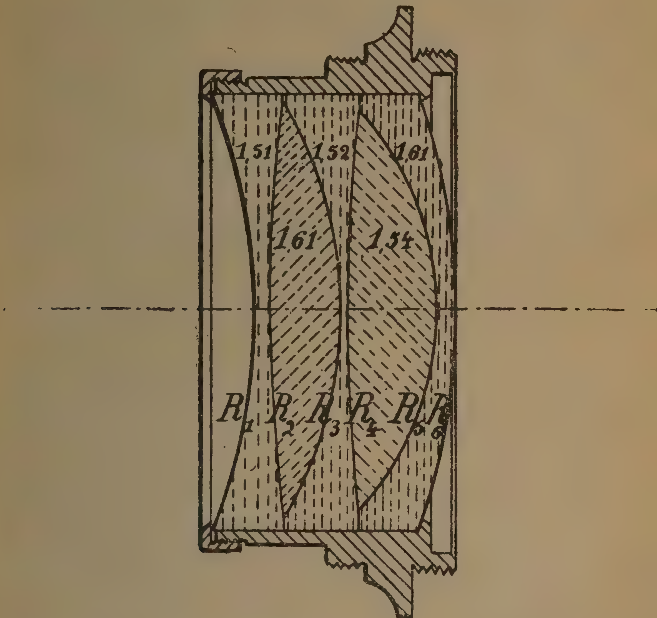
the plasticity required for the next operation. 3. Trim a piece of cardboard to the outside of the modelling frame. Place the tracing, face down, carefully

upon this cardboard, and, with the handle of a toothbrush, or the thumb nail, make a 'set-off' from the tracing on the cardboard. If the 'set-off' or transferred outline is weak, strengthen it with a few strokes of the pencil. 4. Insert the sharp point of a pair of scissors just inside the outline on the card, and very carefully cut out the design close to the pencil lines. The more accurately this is done the better will be the final results (fig. 2). 5. Having made a good 'cut-out,' place it on the face of the mounted print, which is now in proper condition for use, and carefully register the 'cut-out' to the outlines of the subject on the print. If the print has expanded, cut the card away, preferably at the back of the head of the subject, until the 'cut-out' and outlines exactly register. Now place both mounted print and cardboard 'cut-out' in the modelling frame (fig. 1), and securely fasten the frame by the clasps at the ends. 6. With the handle of a toothbrush, or any similar smoothly blunt burnishing tool, begin to rub and press the print from the back, following the outlines of the 'cut-out' and working up the relief desired with care. The dampened print, being quite pliable, responds to every touch. This part of the work is, of course, done with the right hand, the left hand holding the frame to the table and the thumb following the working of the burnishing tool to keep the edge of the 'cut-out' close down to the print, as the dampness of the latter will cause the card to cockle and spring up, thus injuring the sharpness of the outline. When the outlines have been raised to the degree of relief desired, the inside features may be similarly and more freely treated. These may be relieved to about a quarter of an inch. A little experience will enable the photographer to easily and accurately accentuate the light draperies and hold back unimportant details. The relief so gained will remain, and, owing to the paste used, will stiffen, and prevent any crushing of the picture unless severely handled.

A NEW GOERZ LENS.

This consists (as shown in the drawing which illustrates an axial section) of a series of five lenses united together, which must possess certain speeial qualities in order that the object in view may be attained as fully as possible. The figures 1, 51; 1, 61; 1, 52; 1, 54; and 1, 61, attached to the figure, denote the indices of refraction of the glass used for separate lenses in round numbers. In order to obtain the greatest possible strength of light, it is proved to be necessary that at the first refracting concave surface, R_1, as small a refraction (1, 51) as possible should take place, whilst at the last convex surface, R_6, on the other hand, as high (1, 61) a refraction as possible should be present. Furthermore, the first lens must be biconcave, so that at the second refracting surface, R_2, there will be a cementing surface acting as a collector of the light and compensating for the astigmatic aberration; and in order that this surface be as flat as possible, which is desirable to prevent curving of the image, it is necessary that at this second refracting surface as large as possible a difference between the refractive indices of the material of the first and second lens be present, that is, that the second lens be constructed of a glass of high refraction. The second lens must be a biconvex one, and to this must be applied a negative lens of low refractive index, so that at the third refracting surface, R_3, a cementing surface, acting as a light collector, opposed to the second one, may be formed, which, without increasing the astigmatism, exercises a compensating influence upon the distortion which is the product of the other surfaces, so that, by a right choice of the curvature of the surface, R_3, the distortion for a main ray falling sideways will be completely neutralised. For the compensation of the spherical divergence the surface, R_5, is arranged; at this point there must not occur a difference in refractive index much greater than 1, 61; 1, 54; 0, 07, because it must have an exactly fixed depth, which is determined by the direction of the principal

rays which must encounter it under as small a refractive angle as possible, because here, otherwise, the distortion influences would be collected which can no longer be compensated by the surface, R_3. From this condition, and from the condition already set forth, namely, that the last lens must be constructed of as highly a refractive material as possible, it becomes necessary to insert between the lens 3 and the lens 5 a further positive lens of medium refraction. This lens 4 can be either biconvex or concavo-convex, according as the surface, R_4 receives a positive or a negative curvature. As at this surface, on accoun



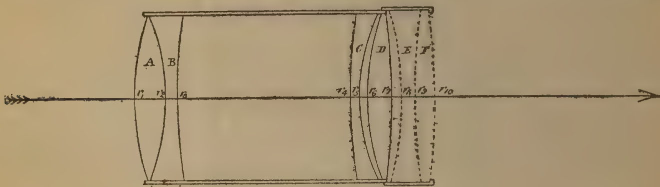
of the very slight difference of refractive index (about 0, 02), the errors of distortion and spherical divergence are very little influenced. The lens may be principally devoted to the complete removal of the chromatic divergence. With the increase of the number of lenses in compound cementing systems, increases, of course, the difficulty of bringing the lenses into the combination in exactly central position, and of maintaining the same permanently in this position. In order to meet this difficulty, Messrs. Goerz and Von Hoegh have arranged in their five lens system that the negative lenses possess a greater diameter than the positive lenses enclosed by them, and that the said negative lenses come in contact by means of their projecting exactly centered edges. They consequently enclose completely the positive lenses, which can henceforth only have one position that is, the exactly correct position in the system,

THE ASTIGMATIC CORRECTOR.

In older types of lenses, especially portrait lenses, in which the character of the glasses employed necessitated a higher dispersive power to accompany a higher refractive index (a condition no longer necessarily existing since the invention of the Jena glasses), flatness of field always involved astigmatic aberration ; or, if the astigmatic error was practically eliminated, the curvature of field was considerable. The construction of the best forms of the older types has been the most skilful compromise between these errors.

Mr. T. R. Dallmeyer remedies this defect by an astigmatic corrector, which eliminates the residual errors (of astigmatism and curvature of field) of the older forms of positive lenses, largely increasing their covering power at the expense of an inconsiderable lengthening of the focus.

For this purpose he places behind any particular form of the old types of lenses, after having determined the residual errors referred to, his astigmatic corrector, which is calculated to eliminate these errors. The form necessary to



do this in the case of Petzval's construction consists of a negative combination consisting of a double concave lens, cemented to a double convex lens of greater dispersive material and higher refractive index. This reversal of material applies in every case, but the shapes of the lenses may be varied for some of the older types of lenses.

The drawing shows the invention applied to the well-known Petzval lens made up of four lenses—A, B, C, and D.

The lenses, E and F, shown in dotted lines, form the astigmatic corrector.

AN OPTICAL DEVICE FOR THE INTENSIFICATION OF NEGATIVES.

This device is due to Lord Rayleigh, who thus describes it :—

Whether from insufficient exposure or from other causes, it not unfrequently happens that a photographic negative is deficient in density, the ratio of light transmissions for the transparent and opaque parts being too low for effective contrast. In many cases an adequate remedy is found in chemical processes of intensification, but modern gelatine plates do not always lend themselves well to this treatment.

The method now proposed may be described as one of using the negative twice over. Many years ago a pleasing style of portrait was current dependent upon a similar principle. A thin positive transparency is developed upon a collodion plate by acid pyrogallol. Viewed in the ordinary way by holding up to the light, the picture is altogether too faint ; but, when the film side is placed in contact with paper and the combination viewed by reflected light, the contrast is sufficient. Through the transparent parts the paper is seen with but little loss of brilliancy, while the opaque parts act, as it were, twice over,

once before the light reaches the paper, and again after reflection on its way to the eye. For this purpose it is necessary that the deposit, constituting the more opaque parts of the picture, be of such a degree as not itself to reflect light back to the eye in appreciable degree—a condition very far from being satisfied by ordinary gelatine negatives. But, by a modification of the process, the objection may be met without much difficulty.

To obtain an intensified copy (positive) of a feeble negative, a small source of illumination, *e.g.*, a candle, is employed, and it is placed just alongside of the copying lens. The white paper is replaced by a flat polished reflector, and the film side of the negative is brought into close contact with it. On the other side of the negative and pretty close to it is a field, or condensing, lens of such power that the light from the candle is made parallel by it. After reflection, the light again traverses the lens and forms an image of the candle centered upon the photographic copying lens. The condenser must be large enough to include the picture, and must be free from dirt and scratches; otherwise it does not need to be of good optical quality. If the positive is to preserve the original scale, the focal length of the condenser must be about twice that of the copying lens.

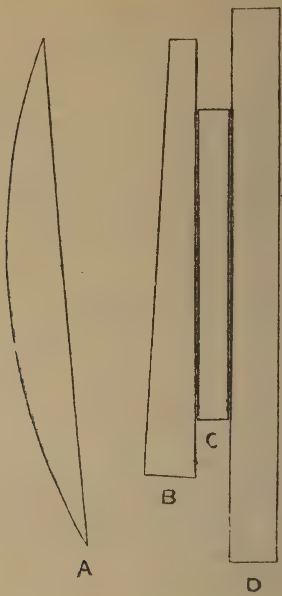
In carrying this method into execution there are two points which require special attention. The first is the elimination of false light reflected from the optical surfaces employed. As regards the condensing lens, the difficulty is easily met by giving it a moderate slope. But the light reflected from the glass face of the negative to be copied is less easily dealt with. If allowed to remain, it gives a uniform illumination over the whole field, which, in many cases, would go far to neutralise the advantages otherwise obtainable by the method. The difficulty arises from the parallelism of the two surfaces of the negative, and is obviated by using for the support of the film a glass whose faces are inclined. The false light can then be thrown to one side and rendered inoperative. In practice it suffices to bring into contact with the negative (taken as usual upon a parallel plate) a wedge-shaped glass of equal or greater area, the reflection from the adjoining faces being almost destroyed by the interposition of a layer of turpentine. By these devices the false light is practically eliminated, and none reaches the sensitive film but what has twice traversed the original negative.

The other point requiring attention is to secure adequate superposition of the negative and its image in the associated reflector. On account of the slight lateral interval between the copying lens and the source of light, the incidence of the rays upon the reflector is not accurately perpendicular, and thus any imperfection of contact between the negative film and the reflector leads to a displacement prejudicial to definition. The linear displacement is evidently $2t \sin \theta$, if t denote the interval between the surfaces and θ the angle of incidence, and it can be calculated in any particular case It is the necessity for a small t that imposes the uses of a speculum as a reflector. In practice 2θ can easily be reduced to $\frac{1}{12}$; so that, if t were $\frac{1}{50}$ inch, the displacement would not exceed $\frac{1}{600}$ inch, and for most purposes might be disregarded.* The obliquity θ could be got rid of altogether by introducing the light with the aid of a parallel glass reflector placed at 45°; but this complication is hardly to be recommended.

The scale of the apparatus depends, of course, upon the size of the negative to be copied. In my own experiments quarter-plates ($4\frac{1}{4} \times 3\frac{1}{4}$) were employed. The condenser is of plate glass, 6 inches diameter and 36 inches focus. The reflector is of silver deposited on glass. The wedge-shape glass attached to the negative with turpentine is 4×4 inches, and the angle between the faces is 2°. The photographic lens is of 3-inch aperture and about 18-inch principal focus. It stands at about 36 inches from the negative to be copied.

* If the glass of the negative were flat, its approximation to the reflector might be much closer than here supposed.

The accompanying sketch shows the disposition of some of the parts. It represents a section by a horizontal plane. A is the condensing lens, B the



wedge, C the negative temporarily cemented to B by fluid turpentine, D the speculum.

PHOTOGRAPHY IN NATURAL COLOURS.

M. DE SAINT-FLORENT'S PROCESS.

Ever since 1873, M. de Saint-Florent has been experimenting with the production of photographs in natural colours upon paper, and he has described before the Société Française his last process, in which he has used the ordinary celloidin paper of commerce. The paper should be exposed to sunlight for from 80 to 100 seconds, till it has assumed a reddish-black colour, and then immersed for ten minutes in a bath composed of—

Alcohol (36°)	100 c. c.
Glycerine	7 grammes.
Tincture of iodine (one per cent)	7 ,,
Strong ammonia	6 drops.

The alcohol may be the ordinary methylated spirit. The paper should be dried in the dark, and then exposed under a coloured transparency till the colours appear, which requires about an hour in the sun, and it should then

be fixed in a six or ten per cent. solution of hyposulphite of soda. In this bath the colours show up very brilliant, and then pale to a lemon-yellow, when the print should be rapidly washed and dried in the sun. The colours will then be revived with all their intensity. If there is no sun, then the print should be surface-dry, and placed in front of a bright fire. It is stated that the colours are permanent.

GRABY'S PROCESS.

M. Graby, in a paper contributed to the Académie des Sciences, also described a process by which he states that permanent results are obtained. The paper may be exposed wet or dry, and it is practically a modification of Veress' and Kopp's process, suggested by them in 1890 and 1891. Kopp used a mixture of zinc chloride and sulphuric acid to form the subchloride of silver, and then bathed the paper in a mixture of potassium bichromate, cupric sulphate, and mercurous nitrate, and fixed the colours by using a dilute sulphuric acid bath. Graby exposes gelatino-chloride paper to light till it is violet, and then immerses it in a four per cent. solution of hydrochloric acid, and dries it in the light, and then immerses in a one per cent. solution of potassium bichromate, dries it, and exposes to light till the gelatine has become quite insoluble, and then it is sensitised in a bath composed of—

Water	70	c. c.
Nitric acid	5	drops.
Mercuric nitrate	2	c. c.
Hydrochloric acid	3	,,
Sulphuric acid	1	,,
Chromic acid	1·5	grammes.
Soda alum	3	,

This paper is exposed damp, and gives good resultss. To expose the paper dry, it is first exposed till violet, then immersed in the acid bath in daylight till blue, then in the bichromate bath, then in a bath of nitrate of mercury, and dried and exposed, and after exposure, immersed in a bath of acetate of lead, and, finally, transferred to a sheet of paper exactly like carbon tissue and finally passed through a bath of salt and mercuric chloride. M. Graby states that red and blue are due entirely to the subchloride of silver, and can be seen by transmitted as well as reflected light at any angle, and, as he calls them, the chemical colours are similar to the colouring matters of flowers. A piece of silver exposed to the vapour of chlorine in the dark becomes first yellow, then red, and then blue, in proportion to the amount of chlorine that it absorbs, and, if this blue chloride be exposed to light, it will turn first red and then yellowish-white in proportion to the loss of chlorine. Silver chloride by itself will give only a dirty yellow, but a mixture of a chromate and silver subchloride will give a golden yellow complementary to the blue violet, and this is reduced by light to all shades of yellow. The yellow is thus, it is said, composed of chromic acid or a chromate, and, on being washed with acetate of lead, is converted into insoluble lead chromate. Blue and red being due to a definite amount of chlorine combined with the silver, it only remains to ensure this, which is done by the mercuric chloride for these colours to be fixed. White was the most difficult colour to fix; but, as this was formed by the bleaching of the blue silver chloride, or, in fact, by the disassociation of the chlorine and silver, and chlorine rendered soluble, the gelatine rendered insoluble by the action of light on the bichromate, it was quite sufficient to treat the paper like carbon tissue to obtain pure whites.

DITMAR'S PROCESS.

Herr von Ditmar has discovered a new process of producing coloured pictures, and some were recently shown at the Trierer Exhibition. They are positives on glass, with a kind of coloured shimmer; red is the only colour which cannot be obtained. The discoverer does not claim that he has discovered any complete or practical process, but publishes the details in order that others may experiment. To prepare the plates, 350 parts of wood spirit, 30 parts of fuchsine, and 8 parts of thymol are intimately mixed and well boiled for a long time, and filtered hot three or four times. The mixture is coated, whilst hot, on the warmed glass, dried, and then heated till the film is no longer sticky. The plate has then a mirror-like surface, and will keep for a month. It has to be exposed under a coloured transparency in the sun. Even after a few minutes, a picture can be developed, but the best result is only obtained after some hours. Development is effected in cold water, which should be slightly acidified in order to set free the oxidising substances in the film. Development should be continued till all details are out, but not till all the the colour has been washed out. The plate is then placed in a half per cent. solution of caustic potash till the black drawing begins to turn a gold colour. It is then dipped into eau-de-javelle or chlorine water, and then removed and exposed to the air till the image turns brown. This last operation may be repeated till the desired colours are obtained. The plate should then be washed with water and dried over a flame. The result depends to a great extent upon the duration of the action of the baths; every kind of fuchsine is not suitable, the best seems to be one that can be bleached with chlorine. Herr Precht, of Heidelberg, points out that fuchsine appears to be one of the substances which have been classed by Otto Wiener as capable of colour absorption under coloured images.

INTENSIFICATION BY MEANS OF FERROUS OXALATE.

In a communication to the Croydon Camera Club, Mr. F. P. Wratten pointed out that this method of intensification is, theoretically, the most perfect, inasmuch as, if properly carried out, the resulting negative image consists of metallic mercury and metallic silver, the whole of the silver of the image being left in the film. However, like most theoretically perfect processes, it needs to be carefully carried out, or stains will inevitably result. This is, in one way, an advantage, inasmuch as, if a negative be intensified by this method, and present no stains when it is finally dried, it may be relied upon to be permanent; whereas, by other methods of mercurial intensification, the operation may to all appearance have been successfully carried out, but, on keeping, stains will gradually make their appearance, and, it may be, a valuable negative will be seen to gradually perish before the owner's eyes.

The ferrous-oxalate method of intensification may be carried out in diffused daylight. If sufficient density is not obtained, the process may be repeated to any required extent.

In the first place, all hypo must be carefully removed by thorough washing. If this has not been done, the hypo should be decomposed by the application of a bath of alum, or, better, a dilute solution (1:200) of hydrochloric acid. Then thoroughly wash and immerse in a saturated solution of corrosive sublimate, to each ounce of which a drop of strong hydrochloric acid has been added, till the image is bleached. Then wash for twenty minutes in running water, rinse with distilled water, and soak in the same for five minutes. The treatment with distilled water is necessary, as the lime in the top water would otherwise cause markings. Immerse the bleached and washed negative in a

solution of ferrous oxalate, prepared by adding one part saturated solution of ferrous sulphate to four parts saturated solution of potassium oxalate. The image will now gradually blacken. When this blackening has extended to the back of the film, pour off the solution of ferrous oxalate, soak in distilled water for six minutes with three changes, and finally wash well. If distilled water has not been employed, it is necessary to soak the plate after washing in a one per cent. solution of hydrochloric acid for a few minutes, to remove the oxalate of lime deposit, then rinse well and set up to dry.

THE WASHING OF GELATINE FILMS.

J. Gaedicke, in Eder's *Jahrbuch*, points out that the diffusion of hyposulphite of soda through gelatine membranes is of special interest to photographers, and an accurate investigation of the subject was made, which confirmed the work of Messrs. Haddon and Grundy.

Three questions were investigated.

1. In what quantities does sodium hyposulphite diffuse through a gelatine membrane into water—(*a*) with various strengths of solution; (*b*) with an upward diffusion; (*c*) with a downward stream?

2. How does a solution of hypo diffuse through a gelatine membrane into solution of common salt?

3. Does gelatine take up the hypo solution in different strengths?

The diffusion apparatus consisted of a strong glass tube of 8·75 mm. internal diameter, and this was covered at one end with a sheet of gelatine swollen in water, of a thickness of 3·27 mm., which is about four times as thick as the film of a dry plate. The hypo was quantitatively estimated by a titrated iodine solution, and a two per cent. solution of arrowroot starch as indicator. A twenty per cent. solution of hypo was made, and this diluted as required. The temperature of the laboratory was kept constant at 17·5° C.

The first series of experiments were made by placing the hypo in the outer vessel, and the diffusion tube suspended in this, and filled with distilled water to the same level as the solution in the outer beaker. It was found that during the hour no hypo had diffused into the inner vessel, which was ascribed to the fact that the gelatine had not become saturated with hypo, and therefore in all the experiments the first hour was ignored.

Experiment I.—In the outer vessel a two per cent. solution of hypo was placed, and the inner diffusion vessel filled to the same level with distilled water, so that the hypo would diffuse up through the gelatine. In thirty-six minutes 0·001 gramme of hypo was found in the inner vessel, in an hour 0·002 grammes. In fifteen hours 0·006 grammes of hypo diffused, not fifteen times as much, but only three times as much. When allowed to stand undisturbed, it is thus seen that the diffusion is very slow, and a film of hypo solution of the same strength as in the outer vessels rests on the film and prevents further diffusion. In order to prove this, the inner vessel was emptied every five minutes for half an hour, and the six waters contained 0·003 gramme of hypo, in fact, three times as much as in the previous thirty-six minutes, and half as much again as in an hour when the water was not changed.

Precisely similar conditions would occur when fixing a plate in a dish. Diffusion would take place immediately, and above the gelatine would be a layer of hypo solution, which would stop further diffusion.

Experiment II.—The above experiment was repeated, using a five per cent. solution of hypo. At the end of the first hour 0·003 gramme of hypo, and in the second and third hour 0·004 gramme, diffused, or double as much as in the weaker solution.

Experiment III.—When a ten per cent solution of hypo was used, 0·007 gramme diffused in the second and third hours.

Experiment IV.—When a twenty per cent. solution was used, in the second, third, and fourth hours 0·008 gramme diffused, whilst in the fifth hour, if the water in the inner vessel was stirred, 0·010 gramme diffused.

From these experiments it is evident that the quantity of salt which diffuses in a given time is greater the more concentrated the solution is, but the increase is not proportional to the increase of concentration of the solution. The advantages of keeping the water moving is shown from Experiment IV.

To test the diffusive power of hypo downwards, the following experiments were made with the hypo solution in the inner vessel, and the water in the outer.

Experiment V.—A twenty per cent. solution was used, and in an hour 0·017 gramme had diffused. In fourteen hours 0·167 gramme diffused, corresponding to an hourly diffusion of 0·012 gramme, which proved that gradually the diffusion decreased, which was due to the difference in strength of the two solutions becoming more equal. This proves that for washing plates it is not advantageous to allow the plate to remain in the one water too ong.

Experiment VI.—This was to determine the diffusion of hypo in concentrated solution of common salt, and it was exactly on the same lines as No. V., only that concentrated solution of salt was placed in the outer vessel. It was found that there was a noteworthy increase in the diffusion ; in the first hour there was 0·015 gramme, in the second 0·012, and in the third 0·009 gramme diffused. The decrease in the rate of diffusion was found to be due to a layer of the lighter hypo solution lying underneath the gelatine, and thus preventing the further diffusion.

Further experiments with the solution of salt were made, and the conclusions arrived at are that a plate can be more readily washed, film up, in a solution of salt than in water, as the lighter hypo rises and gives place to fresh salt water. From Experiment V. it is obvious that plates will wash much more quickly if placed film downwards or upright, as in both cases the diffused hypo sinks to the bottom of the vessel and makes room for fresh water.

In order to decide whether the gelatine film took up a definite quantity of hypo, or whether the quality changed with the concentration of the solution, several experiments were made, but without very conclusive results.

Herr Gaedicke deduces the following conclusions from his experiments :—

1. The quantity of hypo which diffuses in a given time is greater the more concentrated the solution ; but the two are not proportional, the diffusion increasing more slowly.

2. The diffusion upwards, which is but little, is considerably slowed as time goes on when the water is not kept in motion, in that the heavier layers rest on the membrane and only slowly diffuse.

3. When the diffusion is upwards, it is greater where the water is kept in motion.

4. When the water is changed every five minutes, three times as much hypo are extracted as when it is changed every half hour.

5. When the plate is placed face downwards or upright in the water, the quantity of hypo eliminated is about double that when the film is placed upwards.

6. It is not advantageous to leave a plate in the same water too long.

7. In a concentrated solution of common salt, the hypo diffuses upwards and therefore a better washing takes place with the film up.

8. Gelatine takes up the solution of hypo in one concentration.

THE ENAMEL PROCESS ON ZINC.

[Translated from the Photographische Correspondenz.]

AFTER the American enamel process had become so deservedly popular, and had been worked out by experts upon copper in its various modifications (fish glue, Cologne glue,* metagelatine† &c), attempts were soon made from many sides to adapt the process to the cheaper metal, zinc.

The difficulties standing in the way of the process upon zinc were to be found principally in the fact, that the structure changed and became crystalline at the temperature necessary for burning in the glue picture, and consequently good results were not attainable with the usual etching processes. To avoid this difficulty, it was necessary to produce a film of enamel upon zinc at a lower temperature, or to find a modified etching process that would properly etch the zinc in its altered condition. A number of attempts were made in both directions.

In addition to the published enamel procesess, the so-called cold-enamel processses were offered for sale from various quarters; but, notwithstanding their extravagant advertisement, they were not adopted permanently in practice, as it is impossible to attain the resisting power of the burnt-in enamel by any cold process.

The first publications relating to the enamel process upon zinc and its difficulties were by Wilkinson, in 1893,‡, and W. Sicker in 1894,§

Husnik,‖ recommended a primary etching of the zinc with—

Nitric acid	1 part.
Alum	1 ,,
Water	20 parts.

The plate was then prepared as usual with bichromated glue, the image stained with an alcoholic solution of dye, and etched after burning in.

Another proposal was to pour a stained solution of shellac (in chloroform and benzole) upon the image, and, after ten minutes' washing, to develop with a wad of cotton-wool. Husnik remarks: 'The heating of the zinc plate is avoided, but the etching is coarser.'

Concerning the action of dyed resinous solutions further detailed account is given below.

Liesegang¶ recommends a somewhat tedious variation of the etching process, whilst it should be sought to hasten the process by etching for the shortest time possible.

Another formula** contains chrome alum, but is otherwise the same as the process upon copper.

The *Photogram* (1894, July and following numbers) treats of the zinc-enamel process, but does not contain much that is new. It attributes failure to impurities in the zinc, namely, presence of lead.

The *Photographische Correspondenz*, 1895 (pp. 57 and 106), contains a polemical treatise upon the zinc-enamel process, but no special technical directions are to be gathered from it.

Mac Farlane Anderson†† describes a new idea. Resin is saponified, an

* Valenta, *Photographische Correspondenz*, 1895, p. 339.
† V. Turati, *Photographische Correspondenz*, 1896, p. 101.
‡ Eder's *Jahrbuch für Photographie*, 1894, p. 490 (BRITISH JOURNAL OF PHOTOGRAPHY, December, 1893, No. 1754).
§ *Atelier des Photographen*, 1894, p. 702.
‖ *Photographische Notizen*, 1894, p. 164.
¶ *Photographisches Archiv*, 1894, p. 374.
** *Inland Printer*, 1894 (July number).
†† *Anthony's Photographic Bulletin*, 1895, p. 106

the aqueous solution neutralised. He adds some of this solution to the preparation of fish glue, and a small amount of heat is then sufficient to produce a resinous resist.

Hyslop describes a similar process dependent upon fine resinous emulsions.

However beautiful all these processes may appear at first sight, they are of little importance in practice, as the writer has proved by a large number of exhaustive experiments in these directions. It was found possible, even with plain chromated resinous soap, to obtain an image that adhered with gentle heat and afforded complete protection against acids.

Colin Campbell * recommends, instead of fish glue (which requires so high a temperature in enamelling that the zinc is modified), other substances that give a good enamel at a lower temperature; these are obtained from aquatic plants and seaweeds.

H. Müller † published practical experiences with these substances (carrageen moss), and they gave him good results.

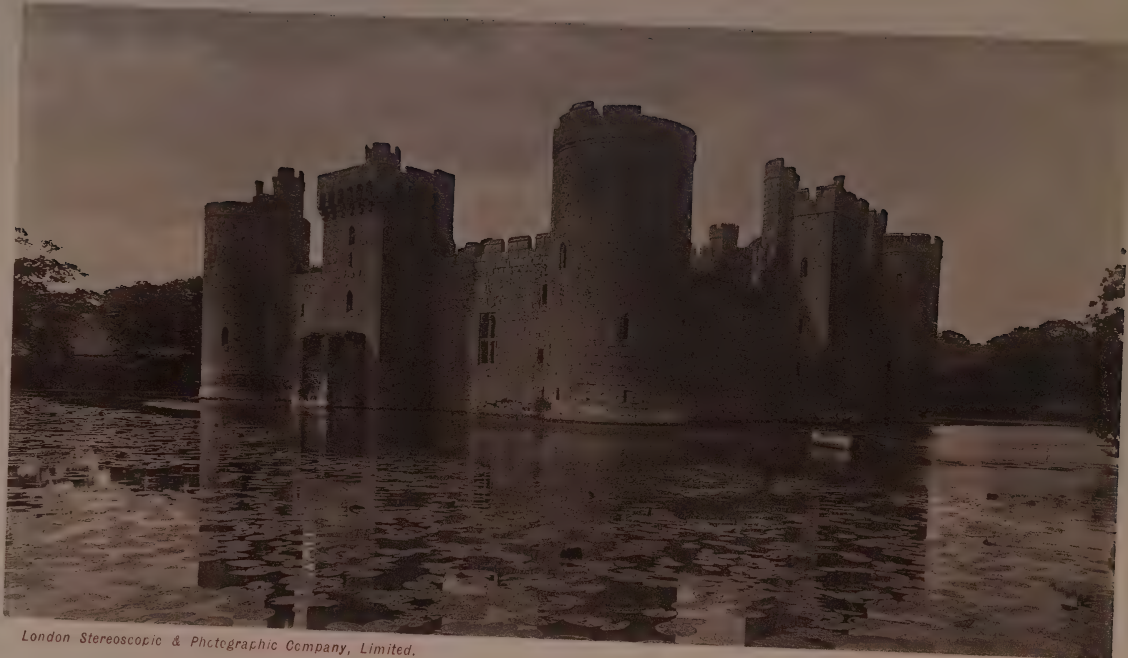
G. Fritz ‡ published, in a paper read before the Vienna Photographic Association in 1895, his experiences of the zinc-enamel process. Preparation, printing, and development present nothing new in comparison with the enamel process on copper, excepting that twenty-five per cent. more water is used for the coating, because, according to the author, zinc is more porous in comparison with copper, and does not take the glue as well; but, in burning in, G. Fritz does not go above 150° C., at which temperature the dye disappears and the film turns yellowish. At this temperature enamel is not formed (fish-glue enamel requires a temperature of 280° C., and the colour then turns to chocolate-brown). For this reason a modification of the etching process is also requisite. Therefore, according to the image, the etching is from three to five minutes with 5 grammes of nitric acid and 400 grammes of alcohol, forty per cent. The plate is then inked up and immersed for about five minutes in a two to three per cent. aqueous etching bath, and finally for two to three minutes in the first alcohol and acid bath. The process takes from thirty to forty minutes, and is said to give faultless results. The alcohol in this process plays the part of a protecting agent to the glue film, which is easily attacked by water.§

Otto Müller ‖ published in July, 1895, his experiences of the zinc-enamel process. His method of preparation was the same as above, excepting that Müller used fresh instead of dry albumen. The development is carried out after coating with a stained solution of resin in chloroform and benzole.

The solutions of resin which we have already met with in a process by Husnik, as described above, serve the purpose of forming a resinous permeable covering to the glue print; that is to say, the watery developer has to make its way to the glue by passing through the resinous film, at the same time dissolving the particles of dye. The unexposed glue then begins to swell and breaks up the superimposed layer of resin, which has become friable, and it is then gradually set free by the watery developer. Gentle friction with a wad of cotton-wool facilitates the operation. The completely developed picture consists of insoluble glue with a coating of resin, and by gently heating to the melting point of resin) they are united to form a skeleton with protective capacity.

As far as the writer knows, the use of these stained solutions of resin was first published by E. Vallot.¶ He used a solution of asphalt and methyl violet in ether.

* BRITISH JOURNAL PHOTOGRAPHIC ALMANAC, 1895, p. 716.
† *Photographische Correspondenz*, 1895, p. 388.
‡ *Photographische Correspondenz*, 1895, p. 224.
§ The same process is described in *Anthony's Photographic Bulletin*, 1895, p. 336.
‖ *Photographische Correspondenz*, 1895, p. 387.
¶ 'A New heliogravure process by means of albumen and bitumen.'—*American Annual of Photography*, 1893, p. 40.



London Stereoscopic & Photographic Company, Limited.

(Photomezzotype), 54, Cheapside, E.C.

BODIAM CASTLE, NEAR HASTINGS.

The process, however, is considerably older, and was formerly used by the writer in an unpublished process (albumen-bitumen), and likewise in connexion with the ordinary chromated albumen printing process on zinc. It is not easy to adjust the proportions of the solution, but the following formula gave excellent results :—

Methyl violet	3 grammes.
Syrian asphalt	10 ,,
Chloroform, dissolve in	200 c. c.

To this is gradually added benzole, 400 c. c., perfectly free from water (the water to be removed, if necessary, with calcium chloride).

Let the solution stand for forty-eight hours, filter, and replace the evaporated chloroform with about 25 c. c. more. By following the instructions exactly a solution is obtained that flows admirably, does not produce lines, and dries at once with a brilliant homogeneous surface.

If we summarise the variations in these processes, we have :—

1. *Alteration of the Zinc Surface by primary Etching.*—The plate is roughed, to make the film adhere more firmly.

2. *Hardening of the Enamel Film by incorporating Resinous Substances.*—These are either added to the solution or applied as a film after printing. In both cases the hardening is effected by gentle heat (melting point of resin).

3. *Hardening the Film of Glue by Tanning.*—The use of chrome alum, tannin, formalin, alcohol, &c., sometimes present in the coating solution, and sometimes in the acid. Variations of this kind have been thoroughly tested in great number by the writer, and they are not sufficient of themselves, but render other modifications of the process indispensable.

4. *The use of Substances more easily changed to Enamel.*—Kinds of seaweed and aquatic plants, with which it is possible to enamel at a lower temperature.

5. *Modifications of the Etching Process.*—The use of etching fluids that do not too strongly attack the slightly enamelled glue ; * and methods of etching that will smoothly etch altered, crystalline zinc (in high-temperature enamelling). Concerning this last method, see following full instructions.

In the years 1895 and 1896 additional further studies were made in relation to the zinc-enamel process.

The writer has already pointed out that the chief advantage of the enamel process—richness of half-tone—depends upon the speading of the etching† (similar to Klic photogravure) and the use of copper, as an excellent metal for etching purposes. Further studies have shown, however, that the same advantages are equally attainable with zinc. These studies led to the following results, which are all based upon a modification of the etching process.

A print upon zinc is burnt in till it attains an intense brown colour, and is then treated with a weak solution of chromic acid, which has an oxidising and slightly solvent action upon the zinc.

The basic, aqueous zinc salt, formed secondarily in the small hollows, by its insolubility gives the process a specific character. If the plate is taken out of the chromic acid bath, it appears to be scarcely etched. If it is now immersed in a nitric acid etching bath, the depth of the etching becomes immediately visible, owing to the solubility of the zinc salt. In case of need, this process may be repeated several times, but with practice it can usually be done at one etching.

To form a clear conception of the nature of the process, imagine, in place of the zinc, a crystalline cake of salt soluble in water, upon the smoothly

* Husnik recommended the use of bromine for this purpose.

† V. Turati : 'Das Durchätzen bei dem Emailverfahren' (*Photographische Correspondenz*, 1896, p. 377.)

polished surface of which water is allowed to act. The water dissolves first the smallest of the crystals, and, penetrating the interstices between the larger crystals, the surfaces of which it merely dissolves and washes, forms an irregular, rough, crystalline cavity. If the water is retarded in its action by the addition of slimy substances (gum, dextrine, &c.), and is likewise turbid (forming a precipitate during the solvent process), the fine crevices will be filled up, and the solvent action will proceed gently within limits, and the points of the crystals will have time to dissolve before the crevices open too far. The formation of the hollow will be rounder and smoother, and very different from that obtained by using water only.

After a clear idea had been thus formed of the causes of the so-called 'rough etching,' it was possible to think out a modification of the ordinary process of etching with nitric acid, that is to say, a means had to be found of converting the process to a slimy, precipitating one. Slime may be easily produced by adding gum, &c., to the etching fluid; a precipitate may be obtained by various means, as well by chemical as by mechanical processes. The addition of various substances to the bath will produce a fine sediment during the etching, and the valleys of the crystalline mass may be filled up, whilst the summits of the zinc crystals are being dissolved. In this way the etching proceeds smoothly and regularly to its full depth.

This action may be easily demonstrated if smoothly polished zinc is heated to nearly melting point, allowed to cool, and then submitted to treatment with various acids.

By the use of a weak solution of chromic acid the zinc is etched, and at the same time the surface is covered with a precipitate of yellowish-brown, basic zinc chromate. If this is wiped away, the etched ground is quite smooth.

With ordinary nitric acid a rough, coarse ground is etched; and, on the other hand, a beautiful, even ground, if the above-mentioned slimy, precipitating nitric acid is used instead.

THE UTILISATION OF THE LIGHT WHICH PASSES THROUGH THE SENSITIVE FILM.

Captain Colson, in a communication to the *Société Française de Photographie*, pointed out that a great deal of light passes through the film, and this can be utilised, and thus the exposure in the camera reduced, if a reflecting surface be placed behind the plate. The idea, as the Captain admits, is not new, but he has approached the subject from a somewhat new standpoint.

He points out that it is essential that the reflecting surface should be in immediate contact with the film, and that the image should fall on the plane of contact. This condition is essential for sharpness of definition and for the purity of the whites of the negatives, for a space between the two surfaces infallibly produces fog. It is also necessary to ensure that the plane of the focussing screen is coincident with that of the sensitive film.

A white surface, such as a sheet of white paper or card, is preferable to a polished metallic surface, in that the latter only reflects the light in particular directions, according to the well-known law that the angle of reflection is equal to the angle of incidence; whereas the card or paper diffuses the light in all directions, independent of the angle of incidence. The surface of the card ought to be glossy.

The first trial of this plan was made by placing a piece of white paper and a piece of black in contact with the gelatine, and with an exposure of 1-15th of a second. That part in contact with the white paper was much more intense than where in contact with the black.

The negatives made in this way are, of course, reversed as regards left and

right, but this is no disadvantage for projection, or for printing in carbon, or for photo-mechanical printing.

The only disadvantage in presenting the glass to the lens is that there is a slight distortion of the image towards the centre of the plate, due to the deviation of the rays, which strike the glass at an angle. Thus, assuming the refractive index of the glass to be 1·55, and the angle of incidence of the rays to be 30°, which corresponds to an angle of view of 60°, the distortion is equal to one-fourth of the thickness of the glass, so that with a glass two millimetres (=1·12 inch) thick, the distortion would be 0 5 mm. (=1·50 inch), which, for scientific work, is far too great, but which is quite negligeable for landscapes or portraiture. These figures only apply to the edges of the plate, and the longer the focus of the lens the less the distortion.

There must be, of course, also some little loss of light due to reflection from the front surface of the glass, and again from the second surface, and this loss increases from the centre to the edges of the plate, but the effects are inappreciable, even with a large field of view.

It might be supposed that the light reflected in the interior of the glass would cause fog, but that this is not so is proved by the fact that the whites remain clear.

To prove that the same intensifying action took place even when the light was very feeble, Colson copied a chromo-lithograph with a pinhole, and found that, with an aperture of 1-100 inch, and a camera extension of ten inches and an exposure of ten minutes, the use of a white card considerably intensified the negative.

In the case of celluloid films there is no loss by reflection, and it is unnecessary, in consequence of the thinness of the support, to expose them from the back.

In the case of a paper support, it will be seen, from the above reasoning, that paper coated with the same emulsion as a glass plate should be more rapid than the latter.

THE GUM-BICHROMATE PROCESS IN THREE COLOURS.

Ritter von Schöller has been using the gum process for producing three-colour prints, and gives some details of his method of working.

For the yellow plate he uses a cell filled with equal parts of solutions of methyl violet and rhodamine, the strength of which is not stated, but must be found by trial and error; as red, blue, and violet should not print, these colours must be opaque in these places, and he used Albert's emulsion 'eos,' and added ten per cent. of the R. P. dye sent out therewith, but Lumière's red sensitive may also be used.

For the red-printing plate a yellow and green sensitive plate should be used, and a filter of cupric chloride with some sulphate of copper.

For the blue plate a solution of aurantia, or a dark aurantia dry screen, may be used.

As pigments, Milori blue, gamboge, and Munich lake were used, and applied to the papers with bichromated gums, and further treated as has lately been described elsewhere. The process is practically the same as that about three years ago published in the *Photographische Correspondenz.*

Herr Watzek, who has also been working this process, uses an ordinary plate without a screen for the yellow plate. The red-printing plate is made behind a Lumière dark yellow screen, with a Lumière A or Edwards plate. The blue-printing plate is made behind a copper-red glass screen, and on a red and orange sensitive Lumière B plate. Watzek uses the same pigments as Schöller, but coats his paper with a two or five per cent. aqueous solution of shellac.

ACETYLENE.

We abstract the following from a Cantor Lecture delivered by Professor Vivian Lewes :—

Acetylene. or, as it is sometimes scientifically called, ethine, is a gaseous compound of twenty-four parts, by weight, of carbon, with two of hydrogen, and was first discovered and isolated by Edmund Davy in 1836, but it was not until 1859 that Berthelot's investigations gave the scientific world a clear conception of its interesting character and properties. Since that time it has been frequently prepared in small quantities by tedious and costly processes, and it is only within the last few years that a cheap and simple method has been discovered, and has brought its use within the range of commercial possibility.

The fact that carbon and lime could be made to directly act upon each other to form calcic carbide was discovered independently by Willson in America, and in France by M. Moissan, but there exists abundant proof that Willson was making and experimenting with calcic carbide, and had sent specimens of it to various correspondents some time before Moissan had made any announcement of his discovery, and therefore priority undoubtedly rests with the American discoverer.

Calcic carbide is a dark grey substance, having specific gravity of 2·262, and, when pure. a pound of it will yield on decomposition 5·8 cubic feet of acetylene. Unless, however, it is quite fresh, or means have been taken to carefully protect it from air, the outer surface becomes slightly acted upon by atmospheric moisture, so that in practice the yield would not much exceed 5 cubic feet. The density and hardness of the mass, however, protect it to a great extent from atmospheric action, so that in lumps it does not deteriorate as fast as would be expected ; but, in the powdered condition, it is quickly decomposed.

On the addition of water to the calcic carbide, a double decomposition takes place, the oxygen of the water combining with the calcium, and once again forming lime, whilst the hydrogen unites with the carbon of the carbide to form acetylene.

At the present moment the future of acetylene as an illuminant is largely dependent upon two factors—the commercial production of calcic carbide of a reasonable degree of purity ; and, secondly, methods for safely making and burning the gas in such a way as to develop its full illuminating power, whilst doing away with the risk of smoking ; and, as I first drew attention to the production of the carbide, and from it of the acetylene on a commercial scale in this country, I feel that the results of the past two years' experience will not be without interest.

In spite of extended experience, both here and abroad, in the manufacture of calcic carbide. the details given as to its cost and the price at which it can be purchased offer the most entertaining reading, as, whilst the patentee and would-be seller of acetylene generating plant still talk airily of the cost of the carbide being anything from 30*s.* to 7*l.* a ton, the price at which one can purchase carbide more nearly approaches 30*l.* Indeed, in Paris, at the present moment, there is considerable difficulty in getting it at 40*l.* a ton, although we are informed that this is merely due to a temporary carbide famine, and that the new sources of supply will soon reduce the selling price even below 16*l.* a ton, at which it stood before the late rise in price. Be this as it may, the factor which interests us is the price at which carbide can be obtained in England, and the Acetylene Illuminating Company, who hold the Willson patents for the production of carbide, and also the Cowles electric furnace patents, which, I believe, enable them to control the manufacture of carbide in this country, have fixed their selling price at 23*l.* per ton ; and, although

there is no doubt that they will give contracts in considerable quantities at a reduction on this price, yet it is with the factor of the selling price to the public, and not with the manufacturing price, that we have to deal.

In most cases, the possible prices quoted for calcic carbide by inventors, who have been carried away by their wishes rather than by hard facts, are simply absurd, and far below the price at which the substance can be produced, and it may be of interest if I give the figures for the electric power necessary, which I myself have obtained in practice in the manufacture of calcic cardide.

Having been kindly granted the use of the electric plant erected for the manufacture of calcic carbide at the experimental works of the Acetylene Illuminating Company, a plant capable of working continuously at from sixty to seventy volts at 1000 to 1200 ampères, I made a series of experiments in order to determine the best proportions in which to mix the ingredients from which the carbide is manufactured, and to find out the amount made per electric horse power.

The production of carbide from lime and carbon, under the influence of the heat of the electric furnace, appears to take place according to the formula—

$$CaO + C_3 = CaC_2 + CO,$$

and, in order to obtain this reaction, it would be necessary to use 56·1 per cent. of lime mixed with 43·9 per cent. of carbon. In practice, however, it must be remembered that the carbon used will either be finely powdered coke or charcoal, neither of which is pure carbon, whilst the lime employed will always vary in purity, such variations having, as I shall presently show, a very important bearing upon the purity of the carbide and acetylene produced from it. Another practical point also presents itself, and that is that, unless the mixture is suitably arranged, considerable variations in the amperage and consequent loss of efficiency in the furnace will result.

Using a mixture of 60 per cent. of lime and 40 of carbon, a run lasting 3½ hours yields about 112 lbs. of fused ingot, and of this 81 per cent. was practically pure carbide, the remainder being a crust of lower value.

The mixed carbides yielded 5 cubic feet of gas per pound, and contained 89·2 per cent. of true carbide, hence the yield may be taken as being 32 lbs. per hour of the commercial carbide.

The current used was 60 volts at 1000 ampères or 89 E.H.F., which gives, as the make, about 0·4 lbs. per E.H.P. per hour and the result of continued experiments shows that 0·3 to 0·4 lbs. per E.H.P. per hour is the average yield.

The cost of the electrical horse power will, of course, vary with the source from which it is obtained, and the use of steam power for generating the electricity appears too costly to be entertained, unless the present electrical lighting stations could see that it was to their advantage to level up their load by manufacturing the carbide under licence when not employed in supplying current directly for illuminating purposes. The Acetylene Company have, however, secured considerable water power at the Falls of Foyers, and a full installation of carbide plant is at work there, whilst still further water power has been secured in a convenient position, and additional works will be erected; but it will always be the demand, and not the cost, of the carbide which will govern the price.

The following yields of acetylene, from various samples of commercial carbide that I have analysed, give an idea of the variations to be found in the article:—

Swiss carbide per lb.—I. yielded 4·38 cubic feet of acetylene; II. yielded 4·60 feet; and III. yielded 4·56 feet.

German carbide per lb.—I. yielded 3·82 cubic feet of acetylene; II. yielded 3·46 feet; III. yielded 3·24 feet; IV. yielded 2·43 feet.

English carbide per lb.—I. yielded 5·24 cubic feet of acetylene; II. yielded 4·84 feet; III. yielded 5·04 feet; IV. yielded 5·52 feet; V. yielded 4·84 feet; VI. yielded 5·32 feet.

It is evident, therefore, that there are wide differences in the commercial article, but, with reasonable care in the manufacture, the carbide should yield an average of 5 cubic feet of acetylene per pound.

The gas obtained from the English carbide is very pure, the chief impurity being 2–3 per cent. of sulphuretted hydrogen, due to sulphur in the coke and gypsum in the lime, whilst with many of the Continental samples 6–9 per cent. of impurities is by no means uncommon, one of the principal and most dangerous impurities being phosphuretted hydrogen, which is evidently due to the use of phosphatic lime in the manufacture of the carbide, and also traces of siliciuretted hydrogen. So bad is this with some samples that the acetylene produced from one batch obtained from Denmark actually gave a haze when burnt for some time in a small room.

It is manifest that, if the carbide is contaminated with calcic phosphide, the action of the water on it must give rise to a certain quantity of spontaneously inflammable liquid phosphuretted hydrogen as well as the gaseous compound, and the liquid condensing during compression or in the storage holder is a very grave source of danger. No lime or coke should be used in the manufacture of carbide which contains more than the smallest trace of phosphate, and, if this point is not more carefully attended to than it is at present in some of the Continental works, serious accidents are sure to follow; whilst, if this be done, as is the case in the manufacture of English carbide, no danger from this cause need be apprehended.

Ammonia is also found as a frequent impurity in acetylene, and gives it the power of attacking copper with the formation of an explosive compound.

In the paper which I read before the Society of Arts in January, 1895, on acetylene, I pointed out the ease with which the acetylene was liberated from the carbide by the action of water, and suggested several forms of apparatus in which such decompositions might be brought about. These suggestions were followed by a rush of would-be inventors upon the Patent Office, the literature of which has been increased to an alarming extent during the past two years by patents, many of which are characterised neither by novelty nor utility, and which, moreover, are in cases fraught with considerable danger. With the further experience which I have gained in the production and properties of this gas, I now see that many of the hints which I threw out in that paper as to the construction of apparatus would be fraught with many drawbacks, as, although most of the dangers with which acetylene was then credited have disappeared into thin air, some other totally unexpected ones have taken their place, and, most manufacturers of acetylene apparatus being still ignorant of these, a lively time may be expected for those who employ apparatus constructed by people who, possessing a limited mechanical knowledge, know absolutely nothing of the properties of the gas with which they are dealing, and these are certain to to give rise to many troubles in use, and so retard the utilisation of this beautiful illuminant.

In the generation of acetylene from calcic carbide far too little attention is being paid to the high temperature evolved when any considerable quantity of it is brought into contact with water, and the effect which this has upon the gas. Several attempts are being made to introduce automatic machines for the generation of acetylene on the principle of the ordinary 'Kipp's' sulphuretted hydrogen apparatus; indeed, several of them are only modified copies of this in metal, and the idea of the manufacturers is evidently that the action will cease, and the evolution of acetylene be stopped, when the pressure of the gas drives the water back from the carbide; but this is not so, as the heat of the action saturates the gas present with water vapour, and, as the apparatus cools, this recondenses on the carbide and produces more gas, whilst the un-

changed carbide will decompose the vapour before condensation, and even dehydrate the calcic hydrate which was formed on its surface when the water was in contact with it. The result of this is that, after the gas has once been made, no automatic arrangement will stop the slow generation of the gas from the carbide in the apparatus.

When the gas is being continually used, this does not matter much, as the slowing down of the evolution of the gas is sufficient to allow the consumption to catch up the make; but, when the gas is turned off, if any quantity of carbide be undecomposed, the automatic generator, with its small holder, becomes an active danger, as it will either 'blow' or generate dangerously high pressures.

In any form of generator where the quantity of carbide is large, the heat generated by the action of the water on the material is quite sufficient to polymerise some of the acetylene into tar-like products, which will sometimes cause trouble and stoppages in the pipes, whilst in any case the high temperatures cause a large amount of steam to go forward with the gas, and, unless special precautions are adopted to prevent it, such as using a sufficiently large holder, some of this is carried forward to the service pipes.

There is no doubt that, for the use of the gas in country houses, a holder large enough for the evening's supply should be provided, and the generators not charged with more carbide than is necessary to yield a volume of gas equal to the capacity of the holder.

The dangers of acetylene, of which a good deal has been heard lately, are almost entirely dependent upon the use of impure carbide and improper apparatus. Pure acetylene has now been shown to be less poisonous than ordinary coal gas, and far less so than coal gas enriched with carburetted water gas, whilst the action of pure dry gas on metals is practilly *nil*.

It is well known that acetylene can be resolved into its constituents by detonation, and the idea has arisen from this fact that acetylene is itself an explosive of great power. This is, however, an error, as it has been clearly shown that, when the gas is under ordinary atmospheric pressure, if detonation is started in acetylene by a charge of mercuric fulminate, the explosion only extends a few inches from the detonator, whilst the explosion in acetylene of acetylide of copper is sufficient to set up detonation of the gas under these conditions.

This, however, only applies to acetylene under ordinary pressure, and any attempts to liquefy acetylene by the pressure created by the evolution of the gas from calcic carbide is an extremely dangerous operation, as, if the heat of generation be added to the heat evolved during compression, an action akin to detonation is very likely to take place, with the resolution of the acetylene into carbon and hydrogen.

Out of the many forms of generator which have been patented in this country and abroad, there are some which, although there is no very startling novelty in construction, yet afford safety in use, and intending users of acetylene apparatus should make sure that the generators they employ have been examined and certified as safe by some competent authority.

I have pointed out some of the troubles existing in the generation of acetylene on a commercial scale, but, given a good form of generator, the trouble which still exists is that there are but few burners at present manufactured which can be relied upon to consume it in such a way as to develop from it its wonderful illuminating power for any great length of time without smoking, and, when the burner itself starts smoking, it can easily be realised that its capabilities in that way are immense.

For domestic illumination a burner consuming more than 1 cubic foot of the gas per hour would have too intense a light to be practically usable, and I have found it possible to make a burner which, for this consumption, shall emit a light of from thirty-two or thirty-four candles, which is ahead of the

duty obtained for the same consumption by any other burners which I have tested; but with all burners, good and bad alike, after a certain period of perfect burning, which may extend to several hundred hours, a time is sure to arrive when the burner commences to smoke, and, as a rule, all that can be done with it is to take it out and put in a fresh one. The cause of this is that in all burners fitted for the consumption of acetylene the holes or slits through which the gas issues have to be excessively fine, and in time the heat of the burner causes the polymerisation of some of the acetylene into liquid hydrocarbons, which, being decomposed in the hole or slit, give rise to a slight carbonaceous deposit and the growth of carbon filaments from the outlet. The carbon filaments can easily be removed when they make their appearance, but the partial stoppage in the fine aperture of the burner itself upsets the balance of the burner and causes smoking.

The fact that burners can be obtained cheaply which for a limited time give satisfactory results enables dealers to sell burners and to declare that no such trouble exists, but the public who are induced to buy will soon discover the facts for themselves.

Acetylene is soluble in water and many other liquids. At ordinary temperature and pressure ten volumes of water will absorb eleven volumes of the gas, but, unless the gas be bubbled through the water, the absorption is hardly noticeable in the case of an ordinary receiver or gas-holder, as the surface of the water rapidly becomes saturated, and after that the absorption is very slow, whilst, when the whole bulk of water is completely saturated, the absorption stops.

The solubility of the gas may also be largely done away with by dissolving salt in the water surrounding the gas-holder; but this has a destructive action upon the metal of the holder, and it is therefore better to use ordinary water as the liquid over which the gas is collected and stored.

The gas can be condensed to a liquid under a pressure of 21·53 atmospheres, or 323 lbs. at a temperature of 0° C., whilst at ordinary temperatures the pressure necessary to keep it in the liquid state is from 500 to 600 lbs. on the square inch, so that the liquefied gas can readily be stored and transported in steel cylinders of the kind employed for liquid carbon dioxide.

The liquid so produced is mobile and highly refractory, and when sprayed into air the conversion of the liquid into the gaseous condition absorbs so much heat that some of the escaping liquid is converted into a snowlike solid, which takes fire on applying a light to it, and burns until the solid is all converted into gas and consumed.

The possibility of liquefying acetylene at pressures about those at which liquid carbon dioxide is produced so largely enables considerable volumes of gas to be compressed into the liquid state in small wrought-iron or steel cylinders, and in this condition, by means of suitable reducing valves and burners of the right construction, it may be stored and burnt. The small cylinders can also be arranged in the form of portable lamps, whilst for use in the country, where no gas is available, a large cylinder of the liquid gas placed in an outhouse would supply a country house with light for a very long period.

It is now well recognised that all luminous hydrocarbon flames owe their light-giving properties to fine particles of carbon liberated within the flame by various processes of decomposition, and raised to incandescence partly by the heat of the flame, and partly by the heat generated by the same actions which caused the separation of the carbon, and it is to the formation of small traces of acetylene in all hydrocarbon flames that a large amount of their luminosity is due. We should therefore expect that acetylene when burnt by itself would be the most brilliant of all gaseous illuminants, an expectation which is fully borne out by the results in practice.

Acetylene gas, when burnt, gives a flame of intense brilliancy, and, owing

to its richness, it can only be consumed in small burners. Under these conditions it emits a light greater than that given by any other known gas, its illuminating value, when properly developed, calculated to a consumption of 5 cubic feet an hour—the average consumption of ordinary coal gas—being no less than 240 candles. It is thus seen that, when acetylene is burnt in suitable burners, it develops an illuminating value fifteen to twenty times greater than that obtained by the combustion of the same volume of coal gas, so that, for all practical illuminating purposes, a very small consumption of acetylene in the burners which practice has shown to be best suited for the purposes, does the illuminating work of a very large volume of coal gas, with the result that the air of the room is but little contaminated with the products of combustion, and the excessive heating of the upper portions of the air is reduced to a minimum.

The following table contrasts the products of combustion evolved from London coal gas when consumed in various forms of burners, and giving an illumination of forty-eight candles, which may be presumed to be the amount of light required in a fair-sized London dining-room, and contrasted with this is the amount of the products of combustion which acetylene would evolve in giving the same amount of light, whilst, to make the meaning clearer, I have added the number of adults who would exhale the same amount of carbon dioxide in the same time:—

Burner.	Gas consumed.	Carbon dioxide.	Adults.
Flat flame, No. 6	19·2	10·1	16 8
,, ,, ,, 5	22·9	12·1	20·0
,, ,, ,, 4	25·3	13·4	22·3
London Argand	15·0	7·9	13·1
Acetylene	1·25	2·50	4·5

If we obtained the same amount of light from paraffin lamps, the carbon dioxide evolved would be equivalent to 22·5 adults; whilst, as far as carbon dioxide goes, you might as well invite 32·7 more guests to dinner as use forty-eight sperm candles to supply the needed illumination.

It has been said that the danger of an explosion from a leakage of acetylene is far greater than with coal gas. This is, I think, a mistake. Mixtures of air and acetylene are explosive over a slightly wider range than is the case with mixtures of coal gas and air; but it must be remembered that, if a leakage were caused by a tap being left on, the largest acetylene burner would probably only pass one cubic foot of gas per hour, whilst an ordinary No. 4 or 5 union jet burner would pass 5 to 6 cubic feet of coal gas in the same period of time, and from this cause, therefore, would be far more dangerous than acetylene; whilst, if the leak were from a small crack or a leaky joint in a pipe, the rate at which the gases diffuse out would be dependent upon their specific gravity. Coal gas has a specific gravity of 0·4 as against 0·9 for acetylene; so that through a crack or fissure of the same size only two volumes of acetylene would escape, whilst three volumes of coal gas would find their way into the air, a difference in rate which would more than cover the slight difference in the limiting proportions of explosion, and very little experiment will clearly prove that acetylene cannot in any way be looked upon as more dangerous to property than coal gas.

The field for acetylene at the present time is simply enormous, as not only is it specially adapted for the lighting of country houses and small villages and towns where no coal gas supply at present exists, but it will probably, in

the near future, take the place of existing forms of lighting in railway cariages, tramcars, floating buoys, &c., whilst, as an auxiliary to the electric light for light-houses, search lights, and coast defence, it will, I believe, be of the greatest possible value.

Should any cheapening of the production of the calcic carbide take place, there is even a larger sphere of usefulness awaiting it—a sphere, moreover, in which the troubles found in the consumption of acetylene, *per se*, will entirely disappear. There are many places in this country where the cost of good gas coal makes coal gas prohibitive in price, whilst on the Continent these troubles exist to a far greater extent, and, if it were commercially possible to use acetylene as an enricher of a cheap fuel gas, an enormous field would be opened up.

When acetylene was first rendered a commercial possibility, numbers of experiments were made in order to see if this could not be done, but the results were most discouraging, as, instead of each 1 per cent. of acetylene added to the diluting gas, giving a value of about 2 candles, it was found that it was necessary to add something like 10 to 15 per cent. before the mixture became endowed with any luminosity at all, and that, with water gas, an admixture with 20 per cent. of acetylene was necessary to give anything approaching a 20-candle gas. With a poor coal gas, however, the enrichment value of the acetylene gives better results, but still not sufficiently good to hold out any great hopes of acetylene replacing oil as a means of enrichment.

This curious phenomenon, of high illuminating value when consumed by itself being reduced so enormously when the gas was used as an enricher, led me to make a long and exhaustive series of experiments on the causes which led to it, and I have now found the reason for this apparent anomaly, and also a way in which it can be obviated. The result is that it would be perfectly easy, by a simple and rapid process, to make a fuel gas costing from 8*d.* to 1*s.* per 1000, and by the addition of 10 per cent of acetylene to raise this to an illuminating value of about 20 candles, a result which, given cheap carbide, would open up an enormous use for acetytene gas.

For use in country houses, or generally for domestic illumination, it has been proposed to dilute the acetylene by means of air, apparatus for making the mixture of acetylene and air having been tried both in this country and in America; but so wide is the explosive range of mixture of this character that any such apparatus would be of the most highly dangerous nature, and, should any one, from want of knowledge, be willing to adopt it, I should expect that the insurance companies would firmly prevent their introduction by declining to insure buildings in which such methods of illumination were adopted. It is perfectly easy to make a mixture of acetylene and air which will burn with fine effect and a non-smoking flame, but the apparatus employed to give such a mixture is always liable to get out of order, and an alteration in the proportions in which the gases were mixed might lead to the most disaatrous results. A safe method of attempting this is to make an acetylene burner in which, in the burner itself, the gas escaping through an injector shall draw in the necessary amount of air for its consumption; but all the burners that I have seen on this principle have the drawback of requiring a high pressure of gas, in order to work satisfactorily, whilst even then the results obtained from them are of a very variable character, and smoking by no means an unknown thing.

Any other diluent than air would require special apparatus for its production, and this would do away with the charm of simplicity in manufacture, which renders acetylene so well adapted for illuminating country houses. It is well known that the carbides of some metals give, on decomposition by water at a slightly elevated temperature, other hydrocarbons, and in some cases mixtures of hydrocarbons and hydrogen, and, if such carbides be mixed with the calcic carbide, the heat of the decomposition of the calcic carbide

by water, and the slacking of the lime produced, causes the decomposition of the other carbides present, and you get a mixture of gases evolved, which can be made to approximate to the composition of coal or oil gas. Taking, for instance, the carbide of calcium and aluminium, you obtain a mixture of marsh gas and acetylene, which, whilst giving a magnificent illuminating power, can be consumed without fear of smoking, whilst, if the carbide of manganese be used instead of the carbide of aluminium for mixing with the calcic carbide, a mixture of marsh gas, hydrogen, and acetylene can be got, and possibly, when the best method of forming carbide has been obtained, it will be found preferable to use mixed carbides of this character rather than calcic carbide by itself.

DEVELOPMENT OF PRINTING-OUT PAPER.

Slightly exposed prints on gelatino-chloride of silver, collodio-chloride, or albumenised paper, may be developed to full strength with gallic acid. This kind of development is called 'physical,' in contradistinction to the 'chemical' development of bromide paper and dry plates.

In 1892 Valenta drew attention to the fact that some other developers besides gallic acid could be used for the purpose. As the method seems to be coming more into use (says R. E. Liesegang), I have made an examination of the behaviour of these substances.

The varying substances, such as hydroquinone, pyrogallol, and para-amido-phenol, act with much greater dissimilarity in physical than in chemical development. According to the method of treatment of the prints with one or other of these developers, or according to other ingredients added, different tones, different shadows, and different gradations are attainable.

We will first make a few prefatory generalisations concerning the properties of the various substances.

Nearly all of them will develop printing-out paper if dissolved in water only; but, whilst gallic acid and hydroquinone may be used in concentrated solution, pyrogallol, eikonogen, and glycin, in strong solutions, act far too rapidly for general use. They must either be diluted very considerably, or their action must be restrained by addition of acid. Mixtures of pyrogallol and citric acid have been repeatedly recommended. Although development proceeds normally, I strongly deprecate the use of very acid solutions, as they are very liable to produce sulphur toning. For this reason I prefer 'weak developers,' preferably hydroquinone or gallic acid, to the others. These two may even be used with a weak alkali. Thus gallic acid is nearly always used with acetate of soda, especially the fused. But this cannot be termed an alkaline developer. It must be remembered that printing-out papers usually contain a considerable amount of organic acid, which enters the bath. A really alkaline developer would immediately blacken the paper uniformly.

The less acid the developer, the greater is the depth acquired by the shadows.

The more acid the developer, the redder the tone becomes in fixing.

The redder a print is developed, the greater is the loss of intensity in fixing.

According to the developer selected, the same print will yield the most varied tones by simple fixation without toning with gold. They may range from green-black to olive, brown, dark red, and even to the pale yellow of a printed picture treated with hyposulphite of soda only.

The latter, especially, cannot be used without further treatment, and must be toned with gold, preferably in a combined toning and fixing bath. In this the picture tones as readily as an ordinary print. The other colours may be used without further treatment with a gold bath. The green pictures may be

toned with gold, but will not give the usual violet 'photographic tone.' If we form a clear conception of the toning process, the difference in behaviour is readily understood. In the treatment with chloride of gold, a film of metallic gold is deposited upon each particle. From its thinness the film is blue. The red of the silver is transmitted more or less through the blue gold, and thus the red-brown to violet tones are produced, to which we are accustomed in the ordinary process. If we attempt to deposit gold on a bromide print, it will not 'tone,' and the same is almost as impossible with the green developed image on gelatino-chloride paper.

It is therefore necessary to discriminate between two principal processes:—

First.—Development followed by simple fixation.

Second.—Development followed by toning. Pictures treated in this way behave similarly to those that are printed out.

The following experiments were made with a species of gelatino-chloride paper (Liesegang's Aristo). For our purpose, the results are applicable to other kinds of emulsion paper, if allowance be made for differences in excess of silver nitrate and acid. The more free silver present, the greater is the depth of picture. The larger the amount of acid in the paper, the less is required in the developer. Strips of paper were exposed for equal length of time under a photometer made of tissue paper, and then immersed in the different developers, with following results:—

Gallic Acid.—A saturated solution was made with cold water. The prints were developed with it in less than two minutes. After fixing, they were green in tone, with almost black shadows. Gallic acid inclines especially to the production of green tones, and the chief point is that the print shall remain long enough in the developer. The picture must consequently be only slightly printed, and, to avoid flatness, the negative must be somewhat vigorous. From flat negatives green prints cannot be obtained, because they cannot be kept long enough in the developer. If a strip of paper is allowed to remain for a minute only in the developer, a fine brown tone is obtained after fixing; even the weak half-tones are not yellow. This is a perfect substitute for gold toning, and I have no doubt will supersede it in time. To obtain this tone with hard negatives, it is only necessary to expose rather longer, for instance, to half print them.

Gallic acid is usually employed with fused or crystallised acetate of soda. This addition tends to accelerate development. The tone is approximately the same as with plain gallic acid. The solution deteriorates more quickly, and a black precipitate of metallic silver is formed; but, by the addition of gum arabic, or fish glue, this decomposition may be considerably retarded. The addition of strong alkalies is quite unsuitable. The bath must be considerably diluted to permit of the addition of a small quantity of carbonate of soda. Phosphate of soda acts like the stronger alkalies.

Salts of lead have very often been used in conjunction with gallic acid. Dr. Van Monckhoven recommended a solution of gallic acid and acetate of lead for his nitro-glucose paper (see Dr. P. E. Liesegang's *Silberdruck*). Lebiedzinsky, in 1890, also gave the following formula for celloidine paper:—

Water	1 litre.
Gallic acid	4 grammes.
Acetate of soda	20 ,,
Nitrate of lead	2 ,,
Citric acid	6 ,,

I have tried the addition of acetate of lead to pure gallic acid, and a heavy white precipitate of gallate of lead was thrown down. A portion of the gallic acid was, of course, rendered inactive, and the solution worked much

slower. I did not find any improvement in the tone. It was formerly thought that the salts of lead conduced to sulphur toning with the combined bath. I have not been able to prove that the small traces brought by the prints into the fixing bath have this effect. There are no considerations that recommend the use of lead salts with the gallic-acid developer.

Gallic acid also develops in presence of citric and tartaric acids. The bath remains clear for a longer time, and works much slower. The tone of the picture is somewhat red, and loses much strength in the fixing bath. Sulphur toning usually occurs if the prints are not thoroughly washed between development and fixation. Sulphite of soda has a decided restraining action, but the pictures do not tend to hardness as with acids, and are softer with larger additions of sulphite to the solution. The tone is red-brown. I have not been able to obtain green tones. An addition of acetate of soda to the bath increases the softness of the picture.

I recommend a bath of—

Concentrated gallic acid solution	20 c. c.
Acetate of soda	1 gramme.
Fish glue	3 c. c.
Water	20 ,,

Hydroquinone, of all developers, offers the strongest contrast to gallic acid. Whilst the latter has a distinctly independent toning action, without recourse to a subsequent toning bath, this is scarcely possible with hydroquinone. Consequently the pictures cannot be simply fixed, and must be treated with a combined bath. It may be used, dissolved in water only, or with addition of citric or acetic acid. Paper developed with plain or acid hydroquinone does not differ from an ordinary print when immersed in the fixing bath. It loses much of its intensity, and turns reddish-yellow. Acetate of soda, again, accelerates the action, and the colour is somewhat browner. This may be increased by a small addition of phosphate of soda, but a slight excess at once blackens the entire film.

Pyrogallol.—For development with water, this can only be used in very weak solution. The colour is a fine brown to warm black in the deep shadows, and, as with gallic acid, the colours produced do not require any further toning. For these brown tones I consider pyrogallol more suitable than gallic acid. Green is also producible, but gallic acid is far superior for the purpose. A more concentrated solution is necessary, and the developer is then too energetic.

Citric or tartaric acid retards development but I prefer to use a very dilute solution of plain pyrogallol, as the acid increases the risk of sulphur toning, and the completion of development cannot be easily estimated owing to the great loss in the fixing bath. Dr. van Monckhoven recommended for his nitro-glucose paper a solution consisting of—

Water	2 litres.
Pyrogallol	1 gramme.
Citric acid	10 grammes.

Cronenberg has used a similar bath for Aristo paper.

Very weak alkalies bring about an immediate discolouration of the entire film, and the same is the case with addition of sulphite of soda. It must be remembered that such a solution of pyrogallol will develop a dry plate (chemically). Moreover, the commercial sulphite is nearly always rather alkaline. A normally active developer is obtained by mixing pyrogallol with both sulphite of soda and a considerable quantity of citric acid, but the tone

is much inferior to that produced by plain pyrogallol. Valenta has chiefly used such a solution, but it should be observed that he supplements it with a combined toning and fixing bath. His formula is as follows :—

Water	1 litre.
Sulphite of soda	100 grammes.
Pyrogallol	10 ,,
Citric acid	11 ,,

Valenta remarks : 'Tho developer is clean and rapid for the various kinds of paper. It is but slightly discoloured after much use, and will keep for some time, even after use. The citric acid acts as a restrainer, and keeps the picture clear. In most cases development is complete in a few minutes, and, after washing in water, the pictures acquire a warm, pleasant tone, ranging from brownish-red to purple-black, by use of the combined toning and fixing bath.'

Para-amidophenol (the pure salt, not acidified with hydrochloric acid).—This acts almost in the same way as pyrogallol. In a weak aqueous solution is quite as suitable for the production of brown tones. If mixed with sulphite of soda (and likewise with citric acid in addition), as Valent and Haneke have done), red tones are produced that necessitate the use of a combined toning and fixing bath. Heneke's formula is the following :—

Water	1 litre.
Sulphite of soda	50 grammes.
Para-amidophenol (acidified with hydrochloric acid)	7 ,,
Citric acid	8 ,,

Ortho-amidophenol.—This behaves in the same manner as para-amidophenol with reference to tone. Apart from the nascent silver, the solution soon assumes a yellow colour, and easily stains the back of the paper yellow, especially in the presence of acetate of soda.

Metol.—This is a very pleasing developer. Greenish and brown tones are both obtainable with it. Very weak aqueous solutions must be used. The precipitate formed is lilac in colour, and does not agglomerate, like that produced with a gallic acid or pyrogallol developer. The addition of sulphite of soda produces an immediate discolouration of the entire film. If much tartaric acid is added, the picture slowly develops yellowish red. It is, moreover, remarkable that long immersion in the fixing bath produces strong sulphur toning (with precipitation of sulphur), notwithstanding the presence of the sulphite.

Pyrocatechin.—This acts like hydroquinone with regard to tone, and the combined toning and fixing bath must always follow. Compared with hydroquinone, it has the disadvantage of producing a yellow (leather-coloured) precipitate, which easily stains the front and back of the picture rather yellow.

Amidol, eikonogen, glycin, phenyl-hydrazine, and amidocoll (*i.e.*, p-amidophenylglycin of Lucius C. Brüning) are much too energetic in plain aqueous solution. A quantity of tartaric acid must be added to restrain their action. Considerations of sulphur toning render these developers unavailable. I may add, that not only for permanency should sulphur toning be avoided, but a very important factor for consideration also is the change in colour of the print.

Tannin.—This also is useless. It develops after the manner of hydroquinone, but easily stains the back of the paper yellow. Moreover, it spoils the combined toning and fixing bath. If, for example, weak alkaline tannin

is added to a solution of hyposulphite of soda, a flocculent substance is precipitated.

Sulphate of Iron.—Used almost excusively for a long time in the development of wet-collodion negatives. This is useless for our purpose, as it stains the front and back of the paper orange, and the discolouration cannot be avoided by addition of restrainers, such as citric acid, sulphite of soda, fish glue, or other admixture.

Consequently, for practical purposes, only gallic acid, hydroquinone, pyrogallol, para-amidophenol, and metol are of importance.

A PROTEID PRINTING PROCESS.

THIS process is the invention of Dr. Max Jolles and Dr. Leon Lilienfeld, of Vienna, who remark that, in contradistinction to the albumens, gelatines, &c., heretofore employed, it has been discovered that proteids in which phosphorus is present can be successfully used. Proteids containing phosphorus, known by the various names of nucleo-proteids, nucleo-albumens, nucleo-globulins, nucleins, paranucleo-albumens, paranucleo-proteids, para nucleo-globulins, para-nucleins, &c., are such proteids containing phosphorus in organic combination. The nucleo-proteids, &c., contain the phosphorus in the form of nucleic acid, an organic acid containing phosphorus which is combined with egg albumen, and gives as products, on splitting up, the so-called alloxur or xanthine bases, guanine, xanthine, adenine, hypo-xanthine, &c., whilst the paranucleo-proteids, &c., do not give the said alloxur or xanthine bases on splitting up.

To the nucleo-proteids belong, for example, the nucleo-albumens, nucleo-histons, nucleins, &c., obtained from animal and vegetable material. To the paranucleo proteids belong, for example, vitelline, ichtuline, casein, legumin, &c.

A suitable proteid or a mixture of several is dissolved in an alkali, alkaline earth, or a salt thereof capable of dissolving the proteid or the mixture of proteids selected, either in the warm or cold state, and the concentration of the proteid solution is brought to the required degree to suit the brilliancy and thickness desired for the time being. For ordinary purposes a 10–12 per cent. solution of the proteids in a 3–6 per cent. solution of the salts will be found suitable. The addition of a small quantity of alcohol is advantageous under some circumstances. The proteid employed can also be tanned with a solution of formic aldehyde, tannic acid, alum, &c. The solution so prepared is salted in the ordinary way with a haloid, and either mechanically or manually coloured or left uncoloured, filtered through paper, flannel, leather, hemp, or the like, or by known methods in either a hot, warm, or cold state as desired, or applied to a suitable paper in its original condition. For this purpose either fine paper, free from woody fibres, or paper provided with a layer of chalk, baryta, or, in general, any other paper suitable for photographic purposes, can be employed. The proteids containing phosphorus can also be used either alone or mixed together, or even in combination with other substances in order to apply them, with a salt of an alkaline earth (barium, calcium, &c.), to the desired papers, to serve as a foundation layer, on which a suitable coating is applied, this coating being already sensitised or adapted to be subsequently sensitised.

The paper can be used satined or unsatined. The paper finally can receive single or multiple coats of the proteid solution selected.

The proteids give, with halogen-silver salts, with correctly chosen concentrations of the proteid and silver solution and correct proportions of added salts, emulsions which, when applied to paper, give a highly sensitive, durable, and brilliant copying or printing paper.

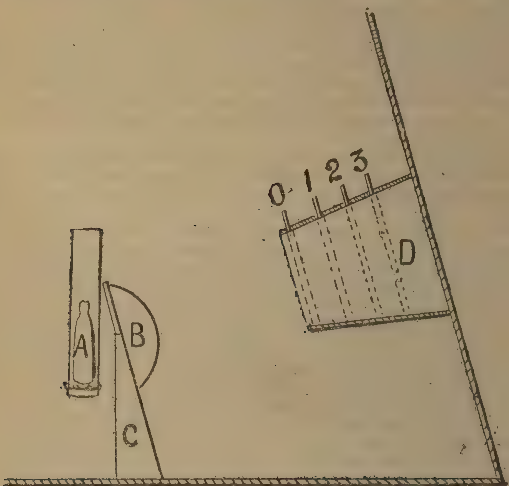
The improved proteids can, if desired, be used with albumen, gelatine, celloidin, collodion, or other known materials suitable for the purpose.

SOME PATENTED INVENTIONS OF THE YEAR.

(*Selected and condensed by the Editor.*)

RETOUCHING DESKS: MCNAB'S IMPROVEMENTS.

THE invention contemplates the use of a steady and powerful light, such as incandescent gas, electric light, and the like; a plano-convex lens or a spherical globe containing tinted water or other fluid, with a combination of ground and tinted glasses, inserted in a conical grooved box.



In this manner Mr. McNab produces a steady and efficient light for retouching, which can be increased or decreased at will, without losing the efficiency of the light.

In the drawing, A indicates the illuminant; B indicates the plano-convex lens with stand, C; D indicates the conical grooved box; 0, 1, 2, 3, indicate grooves and glasses inside box, open at top.

REPRODUCING DRAWINGS: GAY'S METHOD.

THIS process consists in treating glazed drawing-paper with a mixture composed as follows:—

Gum arabic	100 grammes.
Bichromate of potash	40 ,,
Water	300 centilitres.

A certain quantity of commercial carbonate of soda—half a gramme, for example—is preferably added to the water.

This mixture is spread, by means of a plush brush, upon the paper, which is then dried in the usual way.

The paper thus rendered sensitive is ready for the reproduction of a drawing on tracing paper.

As this paper is much more sensitive than ferro-prussiate paper, there is no need for a longer exposure to the light than five to fifteen minutes, according to the clearness of the day and the quality of the tracing paper, the opacity of which varies greatly.

The paper, after exposure, shows a dark yellow drawing upon a brownish ground. The paper is then submitted to a first washing, which must be very delicately carried out; then to a second, with the aid of a sponge, until the lines of the drawing appear hollow, owing to the dissolving action of the water.

The paper is then taken out of the bath, dried first with blotting-paper, and then exposed to the air.

The paper is afterwards coated by means of a sponge with the following composition:—

Gum lac	75 grammes.
Lamp-black	70 ,,
Spirits of wine of commerce	750 centilitres.

It is then plunged into a bath of hydrochloric acid, in which it is allowed to remain for about twenty minutes.

The paper whitens under the action of this acid, and the drawing comes out in black.

It is then cleaned by brushing and washing in pure water, then dried, and the operation is complete.

NON-INFLAMMABLE CELLULOID.

CELLULOID is, as is well known, largely used, but it has the great drawback of being highly inflammable, which renders its manipulation and use dangerous.

For the production of non-inflammable celluloid, Madame Asselot takes the ordinary celluloid and dissolves it in acetone in about the proportion of 25 grammes of celluloid to 250 grammes of acetone. She also dissolves pulverised magnesium chloride in alcohol in about the following proportion:—

150 grammes of alcohol to 50 grammes of magnesium chloride.

Then the patentee mixes the two solutions together so as to finally obtain a paste containing, say, 20 grammes of the magnesium chloride solution for each 100 grammes of solution of celluloid.

The paste obtained in this manner is thoroughly mixed, and after it has been dried constitutes the non-inflammable celluloid.

This new product possesses all the transparency, elasticity, and other qualities of ordinary celluloid, and, in addition, is absolutely non-inflammable.

The new celluloid obtained by this process can be used for all purposes for which the ordinary celluloid is used.

COLOUR PHOTOGRAPHY: BAUMGARTNER'S IMPROVEMENTS.

MR. ALBERT BAUMGARTNER states that it has been already proposed to carry out the process of three-colour photographic reproduction by combining the three colours on one plate, putting them in the form of fine or delicate points or lines, forming in effect three-coloured mosaic. On the plate thus prepared bromide of silver emulsion is put, exposed to light from behind the plate, developed, and thus is obtained a coloured representation by one operation.

This process, however, has not been employed until now, because the manufacturing of fine-grained three-coloured plates offers great difficulty in the usual method of chromo-lithography.

The present process permits, however, of manufacturing such plates without particular technical difficulty, and allows, at the same time, of the employment of any number of colours.

The essential feature of this method is that colours are put on alternately by printing, and in a chemical way, in such a way that, by means of print and oil colour, an incoherent coloured coating graining is first given to the plate, and then the spots or places left uncoloured are afterwards coloured, by means of dyeing, corroding, or etching (like the manipulation in cotton printing), in which operation the colour does not adhere at the places previously printed with oil colour.

If, for instance, a sheet of celluloid is coated with gelatine, or a similar substance, and a red graining is printed on it from a granulated lithographic stone or zinc plate in oil colour, when this plate is dipped into the solution of an aniline colour—for instance, blue-green— only those spots will take up the colour which have not been printed with the red oil colour.

When, again, a graining of yellow oil colour is printed on, which will partly fall over the red and partly over the blue, the result is orange and green; finally, the spots which are not covered by the yellow colour can be dyed still farther, as may be required.

It is obvious that, in choosing the correct colours, and repeating the process several times, many colours can be put on; also fixing of the colours under the influence of light, as in photographic pigment printing, may be done. If, for instance, on a sheet of celluloid a red and a yellow graining are printed, so that the two colours partly cover one another, and the sheet is then coated with a layer of blue gelatine which has been rendered sensitive to light by means of bichromate of potash, when it is exposed to light from behind, and developed in the usual pigment process, blue colour will be found on the spots which have remained free of oil colour, less will remain on the yellow spots, the result of which is green; on the red and orange spots, however, no blue colour will remain, by which means a similar effect will be produced as in the example first given.

One can also proceed in the following manner:—

Upon a celluloid sheet is printed a red-and-yellow granulation, so that the two colours fall partly over each other, then the sheet is coated with a layer of blue gelatine, which is made sensitive by means of bichromate of potash; it is exposed from behind, and developed as in the usual pigment process. On the places which remained white, blue will be fixed; on the yellows, correspondingly less whereby, green is produced; on the red and orange colouring nothing at all, whereby a similar effect is produced as in the first example.

Also here, of course, other colours, and in other succession, can be used.

If the layer is to be produced on glass, one prints upon a transferring paper, and the colour is taken over to the glass.

SENSITISING BROMIDE PAPER ON BOTH SIDES.

Mr. W. Friese-Greene points out that hitherto, in the manufacture of sensitised paper, it has been usual to take paper of special make, and to sensitise it by coating the surface with sensitising materials, such, for example, as solutions of silver, iron, or platinum salts. This method of sensitising the paper is expensive and inconvenient, inasmuch as it necessitates a distinct operation.

He applies the sensitising materials to the paper in the course of its manufacture. The two processes, *viz.*, the manufacture and the sensitising of the paper, are thus effected at one and the same time, instead of, as heretofore, at separate times. The parts of the paper-making and sensitising machinery,

between the place where the sensitising materials are introduced and the place where the finished paper is wound on a drum or roll, should be enclosed, and no light admitted, except through red-covered or other non-actinic openings, and any parts of the machinery with which the pulp or paper web comes into contact, after the addition of the sensitising materials, should be made of substances which will not injuriously affect those materials.

The sensitising materials may be introduced into the paper while this is in the state of pulp, and, in this case, he adds them just before the pulp is run upon the wire web or other 'former,' care being taken to thoroughly mix them with the pulp. He prefers, however, to apply the sensitising materials after the paper has 'formed' and has become more or less dry, or, more correctly speaking, when it is still more or less moist. They can be applied to the surface by a suitable spreader before the paper web reaches the winding-up roll. This spreader may conveniently be in the form of a rotating roller, partly immersed in a trough containing the sensitising materials; the 'formed' web is caused to travel over the upper surface of this roller, and is kept in contact therewith by an upper guide roller, so that the spreading roller, as it rotates, becomes coated with the sensitising materials, and transfers them to or spreads them upon the paper. In order to ensure more uniformity in the distribution, one or more other rollers may be placed between the above-described spreading roller and the paper, like the inking rollers of a printing machine.

If it be required to apply the sensitising materials to both surfaces of a 'formed' and still more or less moist web, it may first have them applied to one surface, in the manner above explained, and then the web may be reversed so as to bring the other surface to the bottom, and this surface may then have the sensitising materials applied to it by a similar arrangement of rollers. Or, when both sides of the moist paper web are to have the sensitising materials applied to them, it may be caused to travel, by means of guide rollers, through the sensitising materials in a trough.

ELIMINATING HYPOSULPHITES : MERCIER'S PROCESS.

PHOTOGRAPHIC negatives or prints, says M. Mercier, are usually subjected to a final treatment by a solution of hyposulphite of soda in order to dissolve the argentic salts, which treatment is termed the fixing, after which they are washed for some time in order to eliminate the hyposulphites. Such washing often consumes a considerable time, especially when the treatment with hyposulphite of soda has been incomplete, as the negatives and prints retain in such cases an argentic hyposulphite which is insoluble in water and withstands the action of ordinary washings.

My invention relates to the use of solutions prepared with the aid of iodine or iodides, bromine or bromides, in the following manner, that is to say :—

1. I may dissolve in water alkaline iodides such as iodide of potassium or iodide of sodium. I have discovered that alkaline iodides decompose argentic hyposulphites contained in the negatives or prints as they are withdrawn from the fixing bath, while thus facilitating the washing of the negatives and prints to a far higher degree than alkaline chlorides, such as common salt, which had been heretofore recommended as a dialytic eliminator of hyposulphites.

2. Instead of using alkaline iodides alone, I may use conjointly with them salts having an alkaline reaction such as carbonate of soda, sulphite of soda, sodic phosphates and the like, or an alkali such as potash soda or ammonia. I have discovered that the elimination of the hyposulphites is thus more rapid than with the iodides alone. I often add to the above compounds a small quantity of common salt, which, however, is not indispensable. As a practical illustration of the above indications, I may use a solution containing

about four grammes of iodide of potassium in one litre of water, or I may use the following :—

Iodide of potassium	4 grammes.
Carbonate of soda	1 gramme.
Common salt	30 grammes.
Water	1 litre.

I may substitute for the above alkaline iodides alkaline bromides, but in such cases the elimination of the hyposulphites proceeds more slowly.

Instead of using alkaline iodides or bromides in the solutions above named, I may prepare them directly with bromide or iodine, which method was the first employed by me, the former process having been discovered subsequently after further experiments.

To prepare the latter solutions, I dissolve iodine or bromine in a suitable quantity of water with an alkaline salt, and by preference carbonate of soda. I may use by way of example the following formula :—

Powdered iodine	3 grammes.
Carbonate of soda	30 ,,
Water	1 litre.

To facilitate the solution of the three grammes of iodine, I dissolve them previously in forty grains of alcohol or thereabouts.

I thus obtain a yellow solution which cannot be used forthwith, for it would corrode the photographic image; it is therefore necessary to wait until it becomes spontaneously discoloured, which requires from one or two days or longer, or it may be discoloured by heating it for a few minutes, or by adding thereto a small quantity of ammonia; when the solution is discoloured and cool, it can be utilised forthwith.

Colourless solutions of the kind above described may be obtained by adding a small quantity of sulphite of soda, or by using the latter alone in lieu of the carbonate of soda; but it is preferable to use the carbonate alone, in order to prevent the introduction of sulphurous compounds in the eliminating means.

To use my solutions, the photographic negatives or prints impregnated with the hyposulphite of the fixing bath are slightly washed with water to remove the largest portion of its hyposulphites, they are then immersed in one of my solutions for a short time, varying from five minutes to one or two hours, according to requirements. The negatives or prints may be passed through several similar baths if required, the operation being completed by washing them for a few minutes in clean water.

The efficacy of my process can be readily demonstrated, particularly as regards negatives or prints which have not been left long enough in the fixing bath and are still impregnated with argentic hyposulphite, which is insoluble in water, and it is easy to ascertain when the negative or print contains no more hyposulphite by slightly touching a point of the white parts of the print with a brush previously dipped in a ten per cent. solution or thereabouts of nitrate of silver, when, if there be any hyposulphite left, there is formed a yellow spot at the said point.

PHOTOGRAPHS ON METALS, PORCELAIN, &C.

Mr. Theodor Häusermann, of Vienna, has patented a process for ornamenting objects of metal, porcelain, or the like, the objects being provided with a coating of chrome glue and exposed to the light and heated to about 300°–400° C. If some parts are to be undyed, these are protected from light by covering them.

The drawings or ornaments are produced by exposure to light of a negative or template pattern of the desired drawing.

At first the object is provided with a coating sensitive to light, for example, chrome blue, then it is exposed to the light, either the whole surface or the part which is not covered; then the parts which are not fixed are removed by washing.

The fixed, but still colourless, parts of the object may then be treated with a solution of water colour (aniline) in order to make them more visible.

This is, however, not essential, it serves only to facilitate the correction and repair of the drawing.

Finally, after the coating has been dried, it is heated to 300°-400° C., preferably by a gas heater, whereby the surface is dyed brown to black.

For obtaining the light sensitive composition he prefers the following proportions:—

Distilled water	100 c.c.
Fish glue or isinglass	60 to 80 grammes.
Ammonium bichromate	3·3 ,,
Chrome alum	1·3 ,,
Ammonia sp. gr. 0·914	4·7 c. c.
Alcohol	4·7 ,,

This mixture is made by dissolving successively with constant stirring:—

Isinglass, with 40 c. c. of water	60 to 80 grammes,
Ammonium chromate, with 40 c. c. of water	3·3 ,,
Chrome alum, with 20 c. c. of water	1·3 ,,

and, while constantly stirring, adding by drops alcohol and ammonia.

URANIUM INTENSIFIERS AND REDUCERS.

The Cresco-fylma Company's method of employing uranium for the above mentioned purposes is described as follows:—

Uranium nitrate, when used in combination with ferricyanide of potash and acetic acid, as is usual in photographic procedure, has the objection that, when there is practically little or no silver reduced by the developer, those parts stain, and render the increase of density and colour so even or technically flat as to be of no great service.

Should this formula (with modifications in the amount of chemicals to suit special purposes) be used, the deposit of uranium is more regular, and increase of range of density or tone much greater, and the results more permanent.

The formula they prefer is as follows:—

	Water	6 ounces.
	Acetate of uranium	120 grains.
Of either	Acetic acid / Formic or citric acid	½ ounce.
	Ferridcyanide of potash	50 grains.

To this formula may be added, for toning bromides and transparencies special colours, sulphocyanide of potassium or nitrate of strontium, from five to seventy grains.

Though we may use acetic acid in the above formula in the case of tabloids, this ingredient would be omitted, the other ingredients ground together and mixed with some adhesive substance, such as celluloid and amyl-acetate, which, though containing no water to start chemical action, would be readily dissolved in acetic acid and water.

The negative, positive, or bromide print to be treated is immersed in the above solution, and the increase of density judged by viewing by transmitted

light, and afterwards well washed in water, to which a small piece of carbonate of soda (one drachm in twenty ounces) has been added.

If it is desired to reduce the amount of density, the film is first intensified, and afterwards transferred to the ordinary hyposulphite of soda fixing bath, to which a few drops (one per cent.) of ammonia is added.

PRINTING AND TONING AT ONE OPERATION: SCHOENFELDER AND KEHLE'S METHOD OF PREPARING THE PAPER.

THIS composition consists of the following ingredients, combined in the proportions stated, and which is called 'stock' or 'ground' solution, viz.:—

STOCK SOLUTION A.

Collodion	
Pyroxyline	300 grains.
Ether	1 pound.
Absolute alcohol	,,

STOCK SOLUTION B.

Fifteen grains of a chloride of a metal of the platinum class, such as gold, iridium, rhodium, osmium, palladium, or platinum chloride, said fifteen grains of chloride being dissolved in one and a half ounces of alcohol (forty per cent.).

One and one-half ounces of Stock Solution A are thoroughly mixed with ten drops of Stock Solution B, and the following ingredients are added in the proportions stated, viz.:—

(*a*) Three grains of an organic acid, such as citric, tartaric, or formic acid, &c., which is dissolved before mixing with the other ingredients in three drops of alcohol;

(*b*) Fifteen grains of silver nitrate or its equivalent, first dissolved in fifty drops of forty per cent. alcohol;

(*c*) One and one-half grains of a chloride—such as strontium, barium, or zirconium chloride—dissolved before mixing with the other ingredients in three drops of forty per cent. alcohol;

(*d*) Two drops of a softening chemical, such as glycerine or castor oil;

(*e*) Five to fifty drops of ammonia (according to its strength), and

(*f*) Two to five drops of gold bromide.

The above emulsion is applied to the surface of the material on which the picture or photograph is to be printed.

The surface must be thoroughly dried before using.

After the print has been made it is given a bath in a solution of sodium hyposulphite, one part to fifteen parts of water, in which bath it remains until all superfluous chemicals have been removed from the picture (about five minutes), when it is taken out and thoroughly washed in clean water. The picture is then ready for mounting, and does not require any additional toning (as the toning has been accomplished simultaneously with the printing), and it has a superior finish of a slight bluish tone that will not fade or turn yellow by being exposed to light. By adding ammonia to the emulsion the time of exposure is greatly reduced, and, by the gold bromide, the tone of the picture is given a slight bluish appearance.

In place of Stock Solution A, a solution can be used composed of gelatine one part, and water three parts, in which case the ingredients mentioned under *a*, *b*, and *c* are dissolved in water instead of alcohol.

PRACTICAL NOTES AND SUGGESTIONS OF THE YEAR.

(*Compiled from Various Sources by* The Editor.)

Absorption.—Professor H. C. Vogel has made a series of experiments, concerning the amount of light absorbed by optical glass, for determining the dimensions of the new refractor for the Potsdam Observatory, with special regard to its photographic use. Vogel's observations agree with Eder and Valenta's. Absorption does not increase constantly at the same rate as the wave-lengths diminish. There is, rather, a constant action over a considerable length of the spectrum, and then a noticeable leap about the region of the G and H lines. Further, with certain specimens of flint glass about 15 cm. thick, two bands of absorption were found ; a very weak one at $\lambda=437$, and the middle of the other, more definite in character, at $\lambda=418$.

For quickly observing the absorption of the more refrangible rays, H. C. Vogel exposed chloride paper under the specimens of glass. The relative absorption was indicated by the time required for colouration of the paper, and silver chloride was very suitable for the purpose, being especially sensitive to the violet and ultra-violet rays. It was found that flint glass transmitted 0·35 to 0·52, and crown glass 0·59 to 0·60 of the light.

On an average, it may be taken that ordinary light flint and ordinary silicate crown of Jena make possess the following degrees of absorption for various thicknesses :—

Lens thickness in centimetres.	Intensity of transmitted light and units of incident light.			
	With reference to absorption only.		With reference to absorption and reflection.	
	Visual rays.	Most active chemical rays.	Visual rays.	Most active chemical rays.
4	0·93	0·84	0·77	0·69
6	0·90	0·77	0·75	0·63
8	0·87	0·71	0·72	0·58
10	0·84	0·65	0·70	0·53
20	0·71	0·43	0·59	0·35
30	0·60	0·28	0·50	0·23
40	0·51	0·18	0·42	0·15

From this table it follows that the large objective of the new refractor at Potsdam, with an aperture of 80 cm., and thickness of 12 cm., loses 40 per cent. of the chemically active rays by absorption. From absorption and reflection together, 51 per cent. are lost. The intensity of transmitted, compared with incident, light is, therefore, as 49 to 100.

Adhesive for Fabrics and Metals.—Mr. T. Stokoe says: It occurs to me that it may be a convenience to some to know that any fabric of moderate thickness can be securely joined to metal with the solution of gutta percha in bisulphide of carbon, which is used or sold by many shoemakers for joining leather. I have recently hinged the metal divisions of my dark slides to the frame with this material and stout ribbon, and find the joints perfectly strong and firm.

Albumenised Paper, A New.—Drs. M. Jolles and Leon Lilienfeld of Vienna have made a number of experiments to find other substances as vehicles for the emulsification of silver in the manufacture of printing-out papers. Dr. Eder gives some particulars of a new printing surface that is being commercially prepared by them. Their experiments have been with the proteids—especially these obtained from maize and other husked seeds—and they have succeeded in making a good, serviceable emulsion paper, which they consider superior to any prepared with gelatine, egg albumen, or collodion. 'Phosphalbin paper,' or 'protalbin paper' are the names under which the new article is likely to be known. The glaze is rather higher than that of albumen, the gradation of the prints is good, and the shadows are deep and brilliant. With Bühler's sulphocyanide of strontium gold bath the tone is a warm purple violet. The paper is not affected by damp, and the surface withstands mechanical injury as well as that of albumen. It will also bear considerable rubbing with wet fingers without detriment to its high glaze. For coating the paper the proteid emulsion is prepared with alcohol, and the prints should be very stable, as the medium does not contain any sulphur.

Aluminium as a Support for Collotype Plates.—A. Albert suggests the following method of working:—New sheets of aluminium should be cleaned with a mixture of ammonia, 1 part; water, 3 parts; and then well dried with a cloth. If they have been previously used for collotype, they should be freed from the gelatine film by treatment with dilute sulphuric acid 1 : 30, well washed with water, and then treated with ammonia and water, as suggested above. The best substratum is waterglass and beer, without any caustic potash. To coat the plates with gelatine, the aluminium should be laid on plate glass and then coated. It is much easier to print on aluminium plates than with glass, as the metal can be turned back like paper, and it requires less printing. For damping these plates in printing, a mixture of glycerine and water only must be used; no ammonia or hypo should be used, as these attack the metal. Printing from these plates is much easier than from glass, as the ink shows up much better, particularly by artificial light, than on glass.

Alumtypie.—Fleck describes, under this title, an aluminium printing process which is stated to have given the most satisfactory results. It is a direct asphalt printing process, and Fleck states that the asphalt used by him is so sensitive as to give a vigorous print in ten minutes in the sun, which requires no auxiliary exposure or heating. Two etching fluids are used. No. 1 consists of

Hydrochloric acid	25	parts.
Nitric acid	25	,,
Saturated solution of salt	50	,,
Strong solution of gum arabic	25–50	,,

For large prints, 25 parts of sulphuric acid are added to the above. This etching solution is allowed to act for from three to five minutes, the plate is then washed, excess of moisture removed, and the print rolled up with equal parts of printing and litho ink diluted with varnish. The plate is then warmed

and dusted with resin powder, and rubbed over with talc powder, and then etched in No. 2 solution of

Ferric chloride solution (35° B.)	100 parts.
Strong gum solution	10 ,,

Fleck uses the gum solution only as a diluent of the iron. The ink-repelling property of the gum as used for stone and zinc work is replaced much more efficiently by the chloride of iron, which he states he has used for some time for lithographic work on stone. This second etching solution is allowed to act for the same time as the first, and the plate then washed and dried, and treated with the following solution :—

Powdered Syrian asphalt	8 parts.
Chloroform or benzole	50 ,,
Oil of turpentine	50 ,,
Oil of lavender	3 ,,
Dye	0·5 ,,

The dye is used to enable the image to be seen better, and to enable one to judge better of the etching. The plate is prepared for printing, and it will give a long run by using

Water	160 parts.
Phosphoric acid	9 ,,
Gallic acid	25 ,,
Tannin solution (1 : 3)	35 ,,

Anti-halation Backing.—M. Ducos du Hauron suggests the following paste, which, before being applied to the plate, must be heated to 40° or 50° C. :—

Paraffin (solid)	20 parts.
Olive oil	20 ,,
Lamp-black	10 ,,

Dr. E. Vogel points out that, for backing orthochromatic plates, yellow collodion is useless, as this permits a considerable quantity of the green and yellow rays to pass, which may be reflected and cause halation. He suggests the use of the following red collodion, which absorbs the whole of the blue, green, and yellowish-green rays, and only allows the red rays to pass, to which the ordinary orthochromatic plate is not sensitive :—

Acridine yellow	10 parts.
Fuchsine	4 ,,
Alcohol (ninety-nine per cent.)	120 ,,

Filter and mix—

The above solution	20 parts.
Collodion (four to six per cent.)	50 ,,
Castor oil	2 ,,
Alcohol and ether	100 ,,

Anti-halation Paper.—Dr. Precht strongly recommends the deep red tissue paper such as is used for making artificial flowers, and he also states that it can be used for dark-room illumination also. The paper, cut to the size of the plates, should be dipped into heavy paraffin oil, and then just rubbed into contact with the glass with the finger. Castor oil may be used instead of the paraffin; or, in fact, any oil which has the same refractive index as glass, which is about D=1·54.

Artigue's Paper.—Herr Watzek points out that, instead of using gum arabic in the Artigue process, gelatine may be employed, if it is used in a liquid state. The image can be obtained of a finer grain and adheres more firmly. As a suitable formula is recommended:—

Gelatine	40 grains.
Chloral hydrate	25 ,,
Water	100 minims.

By using this, the developer may be employed cold, and hastened by the addition of a little carbonate of potash, and it is only necessary to use sawdust to clear up the whites should they show at all dirty. The surface of the paper seems to have no effect when gelatine is used, and the paper is more sensitive and keeps better than that prepared with gum. It might be possible to replace chloral hydrate with glacial acetic acid or some other solvent of gelatine.

Artigue Process.—To those interested in this mode of printing the following extract from Dr. Eder's recent volume on pigment processes may be of service. According to Duchochois, a similar paper to the Artigue may be prepared by an easily soluble mixture of—

Syrup	20 c. c.
Sugar	10 grammes.
Honey	5 ,,
Gelatine	10 ,,
Water	450 c. c.

The whole is dissolved by heat, filtered, and 150 grammes of lamp-black, previously rubbed fine in alcohol, are then added. The paper is brushed over with this solution, the surface equalised, and the sheets are then hung up to dry. The paper is sensitised by brushing over a two and a half per cent. solution of bichromate of ammonia, and after drying the exposure is regulated by a photometer. The print is developed in cold water with soft brushes.

Astigmatism: Testing a Lens for.—Mr. Ernest Gundlach, the well-known American optician, recommends that, to test a lens for astigmatism, the photographer should take a piece of cardboard about ten inches square, cut with a sharp knife across in the centre of it, the lines or slits parallel with the edges of the sheet and about four inches long and one-eighth or three-sixteenths of an inch wide. Fasten the sheet in an upper corner of a window which is so situated that the cross can be looked at from a point or place as far away as possible, say thirty to fifty feet, and with the sky behind the sheet so that the cross appears white upon dark ground. Now put your camera with the lens on at this place, and focus the cross in the centre of the ground glass, the lens being at full opening. Focus accurately, and then turn the camera until the image of the cross has reached the side margin of the ground glass. Here the cross will appear as sharp as in the centre, without refocussing, if the lens is perfectly anastigmatic and the spherical and chromatic aberrations, as well, corrected in this oblique direction as in the centre or optical axis. But, alas! where is the lens that will stand this severe test? If the lens is an ordinary rectilinear, or symmetrical only, the vertical line of the cross will appear fairly sharp, while the horizontal line is much blurred. This is because the focus of this (horizontal) line is *too short;* the lens is *astigmatic. The difference of the focal lengths of the vertical and the horizontal lines of the cross at a given angle of the field and given equivalent focus amounts to the astigmatic aberration of the lens* The requirement of a modern anastigmat is not only freedom from astigmatism, but a flat field at the same time; that is, the foci of the two lines of the cross must not only coincide, but also be in the plane of

the central or axial focus. For this the test with the cross should be made on both sides of the ground glass; or, better, the image should move slowly along the plate from one side to the other. Should the image appear less sharp at any point between centre and edge, the defect is due to secondary field curvature.

Automatic Developer.—Signor Nori suggests the following formula, which is said to produce good negatives, no matter what the exposure may have been, and independently of the character of the plate: Heat a pint of distilled water to boiling, and add to it 1¼ ounces of anhydrous sodium sulphite, and 48 grains of caustic lithia, remove from the fire, and stir till all is dissolved, and add 10 drops of a saturated solution of potassium bromide; allowed to cool, decant from any precipitate, and add 36 grains of hydroquinone and 24 grains of para-amido-phenol, and, when all is dissolved, pour into bottles, which shall be kept quite full. This developer may be used over and over again, and, if the old acts too slowly, from one-fifth to one-quarter of fresh developer may be added.

Backing Mixture.—The following is Mr. J. Pike's formula:—

Gun-cotton	1 ounce.
Methylated spirit	12 ounces.
Methylated ether (·735)	36 ,,
Magenta dye	a sufficiency.
Matt varnish	24 ounces.

Backing Plates.—The following is Mr. J. H. Baldock's formula:—

Transparent celluloid	80 grains.
Acetone	3 ounces.
Amyl-acetate	1 ounce.

Mix and allow the celluloid to dissolve.

This is the foundation of the backing. It may be coloured yellow, orange, red, or black, or a mixture of yellow and red, or orange and red, could be used, by dissolving about two or three grains of those aniline colours in the solution of celluloid.

The coloured solution thus obtained is then flowed over the plate, as was done in the samples sent, or brushed quickly over with a flat dusting brush, laying the plate flat on a piece of pure white paper. When quite dry (if put on over night it will be dry in the morning), it can be peeled off in one piece by first running the point of a penknife along the edge of the plate. It should be applied freely, as the thicker the film the more easily it comes off; but, should it tear and little pieces be left along the edges, do not try and remove them till the plate is fixed and dry, they will do no harm.

Obviously, this cannot be used for films.

Backing Sheets.—A writer in the *Deutsche Photographen Zeitung* stated that he has found that good anti-halation backing sheets can be made by coating stout paper with a solution of ten parts of gelatine in seventy-five parts of water, and adding sixty parts of glycerine, and then dissolving in the mixture sufficient red dye such as aniline red to give it a good deep colour. Such sheets are always sticky and merely require squeegeeing into contact with the back of the plate, and they can be readily stripped off before development. If they get dry and hard through constant use, rubbing them over with glycerine will render them fit for use again.

Blackening Aluminium.—*La Photographie Française* recommends the following process: The metal is first washed with soda and water to remove any trace of grease. It is then coated with albumen, prepared by beating the white of a fresh egg to froth and allowing it to settle. As soon as the film is dry the metal is gradually heated until quite red hot. A crust is formed upon the surface, and, upon its removal, the metal will be found with a deep, black surface, capable of resisting any acid, and so tough that it can only be removed with a file.

Blackening Brass.—Fleck recommends the following method of blackening brass. Clean the brass well, and dip into a mixture of—

Water	100 parts.
Ferric chloride solution (40° B.)	50 ,,
Yellow prussiate of potash	5 ,,

Then wash in water, and heat and rub over with linseed oil, and polish with a soft cloth.

Blackening Iron and Steel.—To give a matt black coating to iron and steel, according to the *Revue Suisse*, the objects, well cleaned, should be immersed or painted with a mixture of—

Mercuric chloride	4 parts.
Cupric chloride	2 ,,
Hydrochloric acid	12 ,,
Alcohol	10 ,,
Water	100 ,,

They should then be dried, and allowed to hang for half an hour in boiling water. If the colour is not dark enough, the operation may be repeated.

Blackening Wood. — M. Koninck suggests the following method of blackening wood, which has the advantage of resisting acids and alkalies:—

A.

Cupric chloride	75 parts.
Sodium chlorate	67 ,,
Water	1000 ,,

B.

Aniline hydrochlorate	150 parts.
Water	1000 ,,

Paint the wood with A and a short time after with B, and remove with a damp cloth the yellow powder that forms. Repeat this operation every day till the desired colour is obtained, and then rub the wood with vaseline or linseed oil. By using potassium bichromate instead of the soda salt a good black colour is obtained at once.

Blue Prints on Linen.—Tranchaut, n his little work, *La Linotypie*, which deals with the making of prints on material, and not with the linotype machines gives the following method of sensitising linen for blue printing. The well-washed linen should be first immersed in a one per cent. solution of hard gelatine, and dried, and then sensitised with one of the following mixtures:—

A.

Ammonio-citrate of iron	27 parts.
Water	100 ,,

B.

Ferridcyanide of potassium	23 parts.
Water	100 ,,

Add A to B, and filter, and keep in the dark. Or the following may be used :—

A.

Citric or tartaric acid	26 parts.
Water	100 ,,

B.

Ferric chloride	20 parts.
Water	100 ,,

C.

Ferridcyanide of potassium	22 parts.
Water	100 ,,

D.

Ammonia	about 40 parts.

Add A to B, and then D, gradually shaking between each addition, and, finally, add C in the same way, and then filter the mixture. The linen can be sensitised by brushing the solution on with a water-colour brush. The latter mixture gives a more sensitive preparation than the former.

Blue Tones on Celloidin Paper—Lainer describes the following method of preparing a bath to give blue tones on celloidin paper, which would, doubtless, also answer for gelatine and collodio-chloride paper. Two grains of ammonium sulphocyanide are dissolved in 10 c. c. of water, and heated almost to boiling point, and then 30 c. c. of a one per cent. solution of neutral gold chloride should be added, in quantities of 3 or 4 c. c. at a time, and, after each addition, the solution heated till the red colour first formed disappears. The solution should be allowed to cool and filtered, and kept for stock. To every 100 parts of a five per cent. solution of ammonium sulphocyanide five parts of this solution should be added. In this bath the print will assume a pure, soft blue tone in four or five minutes and this can be seen on examining the print by transmitted light as usual. The use of a fixing bath with some sulphite in it will tend to give pure whites.

Celloidine Paper, the Preparation of.—Belitzski gives the following method of preparing celloidine paper :—

Strontium chloride (crystal)	30 parts.
Lithium chloride (anhydrous)	10 ,,
Distilled water	62 ,,

When dissolved, add—

Glycerine (by weight)	160 parts.
Absolute alcohol (by weight)	218 ,,

To make the collodion :—

Raw celloidine collodion (three per cent.)	400 parts.
The above solution	30 ,,
Silver nitrate	12 ,,

The silver should be dissolved in 16 parts of water by the aid of heat, and mixed with 30 parts of absolute alcohol, before adding to the salted collodion. Finally, to the collodio-chloride emulsion should be added—

Saturated alcoholic solution of citric acid	12 parts.
Ether	50 ,,

All these should be weighed, and not measured out. If the paper is to be kept, it should be brushed over on the back with a two per cent. alcoholic solution of citric acid. The paper is ready for use in half an hour.

Collodio-Chloride Emulsion.—Vollenbruch suggests the following method of making a good collodio-chloride printing-out emulsion :—

No. 1.

Citric acid	200 parts.
Distilled water	280 ,,

Dissolve by the aid of heat and add—

Lithium chloride	80 ,,

Allow to cool and filter.

No. 2.

Silver nitrate	560 ,,
Glycerine	200 ,,
Distilled water	560 ,,

Shake occasionally till dissolved. To every 1300 parts of a two and a half per cent. cellodine collodion add 13 parts of No. 1 and 92 parts of No. 2.

Collodio-chloride Paper. — In Eder's *Jahrbuch* Herr Haimeke gives the following method of preparing celloidine paper. Baryta paper, as sold by Rives, should be used as a support. The particular formula which he recommends for the emulsion is—

I.

4 per cent. celloidine collodion	670 parts.
Ether	70 ,,

II.

Lithium chloride	1·8 parts.
Strontium chloride (cryst.)	2 ,,
Citric acid	4 ,,
Distilled water	10 ,,
Alcohol	65 ,,

III.

Silver nitrate	22 parts.
Distilled water	24 ,,
Alcohol	150 ,,

In Solutions II. and III. the salts should be dissolved in the water by the aid of heat, and then the alcohol added. The silver solution should be added to the collodion, and then the chlorides, shaking well all the time, and a little glycerine and castor oil should be added to the emulsion. The above formula is suitable for winter work, but in summer it should be somewhat thinned by a mixture of 2 parts of alcohol and 1 part of ether, the exact amount being determined by experiment, the main idea being to obtain a collodion which will flow easily.

Collodio-chloride Prints, Unequal Toning of.—The Editor of the *Photographisches Wochenblatt* recommends an inquirer to soak his prints in a bath of equal parts of methylated spirit and water, and then to wash them if they refuse to tone properly. This defect is due to the horny condition of the collodion. The glycerine and soluble salts are present in minute particles in the film, which resembles a sponge. The film contracts with age, and the

particles are then driven out and absorbed by the paper. In its horny condition the film will not absorb water, and the dilute alcohol restores it by opening the pores and thus enabling the toning bath to act. Finished prints that have been insufficiently toned may be treated in this manner and further toned in the sulphocyanide or combined baths.

Combined Gold and Platinum Toning.—Professor A. Lainer gives the following directions for toning matt celloidin paper. The process gives warm, pure black, brown-blue, or violet-black tones, and likewise a peculiar grey-black with very pure whites. It is very essential that the hands should not come in contact with the fixing bath whilst toning, as the slightest trace of hyposulphite produces stains and markings. The process should be studied by toning prints singly to arrive at the method of obtaining special tones, printed instructions being of little value for this purpose.

1. The pictures should be fully printed and immersed singly in a dish of water. Not more than ten at a time should be treated, and they should be washed for ten to fifteen minutes in two changes of water.

Too much washing, warm water, salt, and hydrochloric acid prevent subsequent direct toning with platinum. If the washing is omitted, and the print placed in the platinum bath direct, without gold toning, sepia tones result after fixing, which may be carried to the black stage in the clearing bath, but the platinum bath rapidly discolours.

2. The washed prints are placed in a gold bath for a few seconds until they assume a brown tone.

Stock solutions :—

A.

Acetate of soda	10 grammes.
Borax	10 ,,
Water	1000 c. c.

B.

Chloride of gold	1 gramme.
Water	100 c. c.

Mix, before use, 100 c. c. of A and 2 c. c. of B. After toning, lay the print in water.

This gold bath is not absolutely necessary, but it is not without influence upon the purity of the final tone, and should never be omitted for grey black. If warm brown or brownish-black tones are wanted, the prints may be transferred to the platinum bath after quickly rinsing in water.

3. The prints are placed singly in the platinum bath and toned to the dark violet or blue-black stage.

The platinum bath may be made as follows :—

Water	100 c. c.
Phosphoric acid	2·5 ,,
Ten per cent. solution of potassium chloro-platinite	2 ,,

If the bath is fresh and good, the prints tone immediately; but, if the prints do not change rapidly from brown to violet, a new bath should be used, and the dish cleansed thoroughly. The slightest trace of hyposulphite spoils the bath, and, the prints will not go beyond the red-violet stage. Short immersion in this bath will produce warmer tones.

4. After the platinum bath, the prints are washed for a short time to remove the phosphoric acid, and then transferred to a ten per cent. fixing bath of hyposulphite of soda. It is very important to use a fresh fixing bath, and, when large numbers of prints are treated, to renew the bath frequently, and not fix all in one bath.

After fixing, the prints are washed for twenty minutes in four or five changes of water. At this stage the tone is usually brown, and, if satisfactory, the prints should at once be mounted.

If pure black or grey to blue-black tones are wanted, the prints should be washed, for five minutes only, in several changes of water, and then transferred to the clearing bath.

5. The clearing bath consists of—

Water	1000 c. c.
Sulphocyanide of ammonium	100 grammes.
Chloride of gold and potassium solution (1 in 100)	20 c. c.

The clearing bath may be used repeatedly, but must be kept clear by filtration.

The clearing bath equalises the tone of the prints, and, according to the length of immersion (from five to fifteen minutes), the final tone may be modified.

Copying Maps.—W. Cronenberg describes his method of reproducing maps and similar subjects, in which it is necessary to render the finest detail correctly. A wet-collodion negative is made upon plate glass, and, after thorough washing, coated with bichromated gelatine, and dried at a moderate heat. The negative is laid face downwards upon a black cloth, and exposed to light from one to three hours, according to density. The plate is then washed to free it from bichromate, hardened in an alum bath, again washed, and allowed to dry spontaneously. It is then etched with a solution of glycerine, and a perfect print is taken from it in transfer ink upon transfer paper. The print is tranferred to stone, and reproduced by lithography. The transfer may be omitted if collotype prints are preferred.

Copying Prints, Drawings, &c.—The following hint from *Die Photographie* may be found of use where torn or folded printed matter has to be copied, and mounting and rolling is inadmissible. A sheet of glass or metal is given a somewhat thick coat of gelatine, and before use it is brushed over with water and glycerine in equal parts. The superfluous moisture is removed with blotting-paper. The prints are slightly moistened on the back, and pressed into contact with the coating of gelatine by means of a roller or the palm of the hand. After the photograph has been made, the prints can easily be stripped from the support, and the coated plate may be reserved for use on subsequent occasions.

Direct Photo-lithography.—Herr Fritz describes the following method of printing direct on to a stone. Good even stones, without chalky or ferruginous spots, should be chosen, and well polished, and then gently heated and flowed over with lukewarm water. The sensitive mixture is composed of 100 parts of good Cologne glue, which should be allowed to swell for twelve hours in water, and then melted in a water bath, and to this should be added a solution of 6 parts of dried egg albumen in 60 parts of water. To every 60 parts of this mixture should be added 500 parts of water and 6 parts of a ten per cent. solution of ammonium bichromate, and then the whole filtered. The warm stone is coated with this mixture in the dark room, then whirled till it is quite dry. The exposure is, according to the density of the negative, for from half to two minutes in the sun, or from five to ten minutes in the shade. After exposure, the stone is inked up with a mixture of 20 parts of Venice turpentine, 20 parts of litho ink, 5 parts of asphalt, and 3 parts of yellow wax. These ingredients should be rubbed up together, melted on the fire, and diluted with turpentine to a syrupy consistence. This mixture is spread over the whole of the stone with a soft pad, the stone then laid in water, and the parts not affected by light will soon begin to dissolve off,

and it may be fully developed with a tuft of cotton-wool; then the stone should be gummed and allowed to dry spontaneously. It may be afterwards treated with water, etched, and will stand all the necessary and usual operations for preparing a perfect stone.

Dry Developer.—M. Bani, of Pisa, recommends the following dry-powder developer for tourists:—

A.

Metol	15 parts.
Hydroquinone	40 ,,
Eikonogen	25 ,,
Boric acid	10 ,,

Mix well, and keep in a yellow glass bottle, hermetically sealed.

B.

Sodium sulphite	100 parts.
Borax	25 ,,
Sugar of milk	25 ,,

For use, mix—

Powder A	2 parts.
Powder B	4 ,,
Water	100 ,,

For bromide paper, dilute this with an equal quantity of water.

Fish Glue in the Gum-bichromate Process.—Herr Raphaels suggests the use of Le Page's fish glue as a substitute for gum arabic in this process as follows:—

Fish glue	5 parts.
Water colours (in tubes)	10 ,,
Potassium bichromate (sat. sol.)	25 ,,

The mixture should be spread very thinly on paper, and when dry it should be printed as long as gelatino-chloride paper, and then developed in cold water. If the mixture is kept a week before use, the exposure is considerably reduced, but an old mixture gives flat prints. Rough paper only should be used, and with pyramidal grain paper exquisite half-tones are obtained; a thin coating gives flat prints, a thick coating harsher prints.

Grainless Emulsion.—MM. August and Louis Lumière contribute to Eder's *Jahrbuch* a paper on this subject, with special reference to Lippmann's process, and further researches have proved that their original method, suggested in 1892, is satisfactory, the great point in it being the admixture of gelatine both with the silver and the bromide solution, and the use of these in a very weak solution. The formula they recommend is as follows:—

A.

Water	200 parts.
Gelatine	10 ,,
Potassium bromide	3·5 ,,

B.

Water	200 parts.
Gelatine	10 ,,
Silver nitrate	5 ,,

The temperature of the solutions must not exceed 40° C. A sheet of glass should be coated with the above emulsion, laid on a slab of marble to set, and

then dipped in alcohol, and the plate washed and dried In order to increase the sensitiveness of such plates, MM. Lumière state that Valenta's method of using sodium sulphite has not succeeded in their hands, but suggest the bathing of the plate in a half per cent. solution of silver nitrate, to which acetic acid has been added. The plates should then be dried and allowed to remain for some hours at a temperature of 25° C., during which time an increased sensitiveness equal to sixty times often ensues. The plate must again be washed and dried. Formic acid may be used instead of the acetic acid, but it is rather more difficult to control. For Lippmann's process it is, of course, necessary to add some dyes, such as erythrosine, cyanine, or methyl violet, to increase the colour sensitiveness.

Ground Glass.—Rev. Arthur East says that there often appear in photographic papers articles on *substitutes* for ground glass, it being little understood, probably, what an exceedingly easy process it is to make the very thing itself; and that starch, arrow-root, and suchlike things are almost, if not, quite as much trouble to utilise (and of not one-tenth the beauty and durability) as ground glass at home.

The following plan may, therefore, be acceptable:—

Take a clean negative glass of any size, and lay it on a flat, hard surface, such as a board or stone slab, sprinkle on this a pinch of emery powder, No. 1 (flour of emery will *do*, and do well, but the next quality, coarser, works more quickly). Lay on this a piece of broken glass about an inch square or thereabouts, and *moisten* the emery with a little water (do not use much so as to let it get 'sloppy,' and work all about).

Now work round and round all over the negative glass with the moderate pressure of two or three fingers until the gritty sound begins to go, which means that your emery is getting ground too fine (this will be in about a minute or two). Put on another pinch of emery, and work as before; in about ten minutes rinse your plate under the tap, and you will find probably with your finely ground surface a few 'islands' looking shiny, return the plate to the board, and work these patches out, and you will find a surface ground as finely as any you can buy, and there is no difficulty whatever in getting a perfectly even surface free from any scratches or defect whatever.

Any ironmonger will supply the emery, a pennyworth by post if you live 'beyond the region of lamp-posts,' and even the ordinary domestic knife powder will do, but it is too fine and works too slowly, and is inclined to be gritty and make deep scores in the surface of the glass.

If an extra finely ground surface is required as for a focussing glass, it only means rather longer grinding, and perhaps a little flour of emery to finish with; but the whole process can easily be done with one quality of emery, of which the best is probably the No. 1. If the surface of negative glasses were perfectly flat, it would be possible to grind two together, but the surface is never flat, and a small piece of glass is best to grind with. Some samples of glass are harder than others, and take rather longer to finish.

Halation.—Dr. E. Vogel discusses the merits of certain kinds of backing that are used to obviate this evil. It is impossible to counteract it completely, as there is not only reflection of light from the back of the plate, but a certain amount of diffusion of light in the gelatine film itself. A very effective backing is a mixture of lamp-black and castor oil, or, as recommended by Cornu, oil of cloves, turpentine, and lamp-black. These are perhaps the most effective backings, but they are so objectionable in practice, that they cannot be used when travelling, and to prepare or clean such a backed plate is one of the dirtiest operations in photography. Stolze recommended collodion stained with aurine. 100 grammes of aurine are dissolved in 200 c. c. of warm alcohol, and filtered. 100 c. c. of this solution are added to 300 c. c. of two per cent.

raw collodion and 4 c. c. of castor oil. This backing of yellow collodion is very effective and convenient, but does not protect orthochromatic plates as much as might be desired, as only the blue and part of the green rays are absorbed by it. For orthochromatic plates the collodion should be stained with other dyes. Erythrosine is a good dye for the backing when the plates used are sensitised with erythrosine; but Dr. E. Vogel specially recommends a mixture of acridine yellow and rubin (fuchsin). Dissolve 10 grammes of acridine yellow and 4 grammes of rubin in 120 c. c. alcohol (ninety-nine per cent.). Filter the solution, as the acridine yellow usually contains a considerable admixture of dextrine. Take 20 c. c. of the solution of dye and add it to 50 c. c. of a thick four per cent. collodion, and 2 c. c. of castor oil. The stained collodion thus prepared should be made up to 100 c. c. by adding alcohol and ether in equal quantities. This red collodion also makes a good coating for dark-room windows, or electric lamps.

Halation and its Remedies.—The following communication from Mr. George Bankart is of especial interest :—

The subject of halation seems to be occupying some little attention just now, and as I have had considerable experience, of a gratifying nature, in respect of a remedy for it, I venture to offer a few remarks on the subject.

The solution I use for backing plates has been in constant use for six or seven years, and I am so satisfied with it that I would not change it for any other published process. I have given it the crucial test of *two hours'* exposure upon dark interiors of churches and cathedrals, with brilliant windows staring straight into the lens, without the least indication of halation, and the same tests, with shorter exposures, of twigs and leaves against a bright sky, perfectly clean and bright, and I do not think we need ask for any test of a more severe nature.

It appears to me that the desirable qualities of a 'backing' solution for plates are .—

(1) Ease of application, with speedy drying, so that the plate may be put into the dark slide, soon afterwards, without sticking to, or making a mess with, its interior.

(2) Good keeping qualities (if the plates are stored away) without detriment to the film, and freedom from abrasion in the form of 'dust,' which is apt to get on the surface and cause pinholes, by holding back the action of light.

(3) Ease and celerity of removal, sufficient for development purposes, so that detail and and density may be properly judged.

(4) That the colour quality of the backing and its 'optical contact' shall be as perfect as possible.

I claim all these points for my 'backing' solution, of which the following may be accepted as a good formula :—

Benzole, in which is dissolved sufficent *pure* indiarubber to give it a mucilaginous or sticky quality (don't try 'vulcanised' rubber, because it is insoluble), this is to make it tenacious to hold the *powdery* colouring matter, which gives body to it, and to prevent it chipping off in dust under ordinary transit in the slides. To this solution add finely powdered 'asphaltum' until it is the consistency of *thinnish treacle*, so that it can be poured out of a bottle, and spread easily with a flat camel's-hair brush.

Let me say, first, that the dark brown colour of 'asphaltum' is very absorbent of such rays as pass through the gelatine film, and (what is considered of some scientific importance) that the 'index of refraction' is said to be nearly the same as that of glass.

Now for the methods of application, and removal, which are the practical points of most interest to operators. I work on '11 × 9' plates, and there-

fore the method of work may be taken as a fair criterion; users of smaller plates will find it still easier.

Cover the working bench, or table, in front of the light of dark room, with sheets of blotting-paper, on which to lay the plates, face down, as coated, and, in front of operator, lay a square of *black*, soft material, such as velvet or mackintosh cloth, on which to lay, *face downward*, the plate to be 'backed' as the black throws up the white square of the plate and renders the edges distinctly visible.

From the bottle of backing solution pour a small pool into the *centre* of the plate, and spread it as *quickly as possible* to the corners and sides of the plate with the flat brush, working it across and across to get evenness as long as the solution will *allow* you to do so, as it sets rapidly. Do not use more solution than is absolutely necessary to cover the plate easily, and the quantity to pour on will soon be arrived at by experience.

Lay aside this plate on the blotting-paper, face downwards, and proceed with others in the same way. By the time six have been coated the first is dry enough to go into the dark slide, but may still be 'tacky,' and it may be best to lay a sheet of tissue or other thin paper over the back.

My plan is to 'back' a number at once—never less than a dozen plates, sometimes six dozen—and to store them away in grooved boxes.

If wanted for travelling purposes, I put them in grooved boxes in pairs (face to face) for twelve hours or so to harden. Then they are quite firm, and will not stick to anything, and can be 'packed' in any way desired.

Some one may say, 'What a nasty mess to use!' If you stick your fingers into it, it is nasty; but if you do the work cleanly, and only touch the solution with the brush, it is perfectly clean and easy to manipulate.

Having exposed your plate, you now want to *remove* the backing *before* development, as nothing can be seen through it against any dark-room light. I know some users who fail to satisfy themselves, and make a mess of getting it off. Do not attempt it by 'solutions' of any kind. Lay the plate, *face downwards*, on a sheet of clean blotting-paper, take a *sharp* carpenter's chisel, (one of an inch and a quarter or an inch and a half is a good size to use for a large plate, or a one inch for smaller ones), commence at one corner, and, with sharp edge, push the film of backing off *in the direction of the centre of the plate*, just as if you were 'planing' it off. Keep the blotting sheet turned round as you proceed till you have been all over it, then sweep the stuff off into a spare plate box, wipe the *back* of plate well with a duster, and it is clean *enough* for *all purposes of development;* and what slight remains of solution is left on will do no harm to the developer.

The chief point of success in this part of the work is to have your chisel *as sharp as possible*, and take *care of your fingers* in using it If the stuff is properly made, it scrapes off the plate with a sort of 'cheesy' consistency in 'flakes,' not in splinters or powder, and if preserved, and the operator studies economy very closely, it can be redissolved, in fresh benzole and rubber, and used over again indefinitely. The celerity of removal is such, with a good chisel, that I can clean off the backing from a dozen plates quite as quickly as I can coat them, and I think that is quickly enough for anything.

There is a slight sticky residue left on the plate, and I find the easiest method of removing it is, after the plate has been fixed in hypo and alumed, to rub the back, whilst still wet, with a piece of rag or tow and some powdered pumice stone, and swill the residue off under the tap. Dry the negative as usual, and, if any slight residue is left on the glass, a rag moistened with benzole will remove every trace, and leave the plate clean.

The subject of halation does not end with prevention by 'backing' of the faults so glaringly visible in an unbacked negative; there is an inner and subtle quality about the *definition all over* a properly backed plate which can only be appreciated by those who have used 'backed' plates under every kind of

circumstance, and it is a cure for the general haziness and indefinite quality of definition known as over-exposure, which is practically a kind of halation of *every overlapping portion of detail* in the picture. Taking 'landscape' as an instance, where there are considerable varieties of distances, it will be found that over-exposure causes them to blend into each other at the edges, and is really halation of such lines, but backing the plate preserves these edges even in the most delicate gradations, and so preserves the over-exposed plate from the loss of these definitions; in other terms, it enables longer exposures to be given with impunity, and without loss of the delicate gradations which would be hopelessly degraded in an unbacked plate, and therefore is of immense importance in preserving *the purity of gradation of tone* in any photograph, and especially so in architectural work and interiors.

Now, I do not make this 'backing' solution myself, I have plenty else to do, but I got my local chemist here to make it for me in the first instance, and he has experimented largely with materials, and his present make of solution is a considerable improvement upon my own as originally tried. His additions and improvements are his own trade secrets, but I can strongly recommend any one to give it a trial.

The solution can be 'tempered' in such a way (to the desire of the user) that it will either dry very rapidly (two to three minutes) or, if the operator is not in a desperate hurry, it can be made to dry more slowly, say, ten to fifteen minutes, and is then more easily manageable in coating the plate, and it will dry with a more even and smoothly surfaced face.

The chief point to bear in mind as to comfort in using it is the method of removal by the sharp carpenter's chisel. It *must* be kept *very* sharp to be effective, a rough-edged chisel does not clean the glass so perfectly, and 'rags' up the coating into small bits instead of broad 'flakes.' I can only say to your readers, 'Try it,' and I hope you will not be disappointed.

I have no interest whatever in the sale of the stuff, but it can be got at a very reasoable price, in bottles, of any size desired, from Mr. Joseph Young (photographic chemist), Gallowtree-gate, Leicester, and orders should state whether it is desired to dry rapidly or moderately so.

Halation: Preventives of.—V. Teran in the *Photo-Gazette* writes: A method of coating the back of the plate with a substance capable of absorbing actinic rays has been recently advanced by M. Mussat, and is deserving of more than passing notice. M. Mussat makes use of gelatine rendered insoluble by means of formalin. With this insoluble gelatine he prepares films, which are applied to the back of the plate and which can afterwards be easily removed. His mode of procedure is as follows: The gelatine is softened in cold water, and then dissolved by placing the vessel containing it in a salt bath; some glycerine is then added, together with some finely ground red ochre. Suitable proportions of these substances are:—

Gelatine	15 parts.
Water	100 ,,
Glycerine	12 ,,
Red ochre	15 ,,

The mixture is shaken till thoroughly mixed, and, whilst still hot, is poured on to a glass plate previously cleaned and talced. A more even coating is obtained if the glass is previously warmed. The gelatine will set in a few minutes, and the plate is then placed in a bath of commercial formalin (containing 5 parts of formalin in 100 parts of water) for a quarter of an hour; it is then washed and dried. When thoroughly dry, the film will easily detach

itself from the glass. To use these films, they are given a thick coating of an adhesive containing—

Gum arabic	75 parts.
Glycerine	12 ,,
Water	125 ,,

A little salicylic acid may be added if it is desired to keep the mixture very long. After having been thus stripped and coated, the film is applied to the back of the sensitive plate (of course, in the dark room) and the plate stood up to dry. The plates can be kept when once prepared in this manner and are ready for placing in the dark slides. Before commencing development, the plate is placed in water, when the film will detach itself in a few seconds. If removed with care and dried, it can be used a second time. The author of this method has obtained excellent results with plates prepared in this way. The obvious advantages are, that it is very handy, and does not stain either baths or fingers; but there seems to be some difficulty in employing it with plates of fairly large size. Even with plates 13×18 centimetres (7×5 inches approximately) difficulty was experienced in securing perfect contact between the film and the glass—a condition which is quite indispensable for counteracting halation.

For large-sized plates we have seen a black matt varnish (obtainable at all oil and colour merchants) used with success. It dries instantly. Before commencing development it must be removed with a pad moistened with alcohol.

It is, however, much preferable to use a backing mixture recommended by M. Drouet, the formula for which is as follows. 100 parts of red ochre are mixed with 50 parts of dextrine, both dry; the whole is finely powdered, and 50 parts of water and 5 parts of glycerine added. An antiseptic is added if it is wished to keep a large quantity, but the preparation of the mixture is so simple that it may be freshly made for each lot of plates to be backed. It is easily spread on the back of the plate with a flat brush. Before development the coating can be removed by simply washing the plate in a dish or under the tap.

Home-made Lantern Plates.—Eckhorst, in *Der Amateur Photograph*, recommended the following method of making lantern emulsion. Heat in a water bath to not above 50° C. the three following solutions :—

No. 1.

Heinrich's hard gelatine	5 grammes.
Distilled water	40 c. c.
Alcohol (40°)	10 ,,
Ammonium bromide	7 grammes.

No. 2.

Heinrich's hard gelatine	5 grammes.
Distilled water	40 c. c.
Alcohol (40°)	10 ,,

No. 3.

Silver nitrate	11 grammes.
Distilled water	12 c. c.

Ammonia, *quant. suff.*, to dissolve the precipitate first formed. Solutions Nos. 2 and 3 are mixed together, and then in the dark room No. 1 is to be added, the emulsion well shaken, and poured out into a flat dish to set. It should then be cut up into strips, washed for eight to twelve hours in frequently changed water, collected on a filter, pressed, and dissolved at 50° C., and coated on glass in the ratio of 8 to 10 c. c. for a 13×18 cm. plate.

Incandescent Light and Gas Chimneys.—Dr. H. W. Vogel gives some particulars of a new incandescent gas mantle and a new chimney. The new mantle gave the following results as compared with the Auer light:—

	Date.	Pressure.	Temperature.	Gas per Hour.	Intensity. Hefner Candles.	Gas per Hefner Candle.
New light,	15, 2, 1897.	47 mm.	12° C.	133·3 l.	95·74	1·393 l.
Auer light,	29, 9, 1895.	48 ,,	18° ,,	126·60 ,,	60·44	2·9 ,,

The new mantle not only gives more light, but is more economical, the consumption of gas per Hefner candle (=1·1 standard candle) being only about one-half. The new chimney is made by Schott & Genossen, of Jena, and is fireproof. Some minutes after the gas had been lit the chimney was sprinkled with cold water, and remained sound. A new feature in the construction is the arrangement for supplying air. At the height of the flame there are holes in the side of the chimney, and the gallery upon which the chimney rests is closed. Dr. Schott finds that the light is increased ten per cent. by this arrangement, but Dr. Vogel differs from him, and affirms, as the result of comparative experiments, that the amount of light is the same.

Intensification.—Paul V. Janko has been determining the various degrees of intensity given by the best known intensifiers, and has drawn up the following table.

Bleached in	Blackened by	Ratio of Intensity
Cupric Bromide	Metol	15 : 14
,,	Hydroquinone	15 : 13
,,	Pyrogallol	15 : 12
,,	Silver nitrate	15 : 8
—	Mercuric iodide (Edwards)	15 : 10
Mercuric Chloride	Sodium sulphite	15 : 14
,,	Ferrous oxalate	15 : 13
,,	Hydroquinone	15 : 12
,,	Hyposulphite, or with ammonia	15 : 11
,,	Ammonia	15 : 10
,,	Ammonia, the plate being dried before blackening	15 : 8·5
,,	Ammonium sulphide	15 : 7
—	Uranium	15 : 6

The uranium intensifier gives the greatest increase, next ammonium sulphide, a result which agrees with practice.

Iodine as an Accelerator in the Hydroquinone Developer.—M. Cousin states that the addition of iodine in small quantities to the hydroquinone developer gives much better blacks on bromide paper, and, in large quantities, makes the image appear more quickly, and gives much flatter results. The iodine water is made as follows:—

Potassium iodide	5	parts.
Iodine	1·5	,,
Water	15	,,

When dissolved, make up to 250 parts with water. The particular developer he recommends is :—

Hydroquinone	1 part.
Anhydrous sodium sulphite	4 parts.
Saturated solution of soda carbonate	10 ,,
Ten per cent. solution of potassium bromide	3 ,,
Water	100 ,,
Iodine water as above	3 ,,

Labels on Glass.—To write on glass, a mixture of two parts forty per cent. water glass, and one part of caustic soda should be used with a steel pen, allowed to nearly dry, and then dusted with the desired colour, such as lamp-black, barium sulphate, &c.

Lithographic Ink.—The following receipt is given for Lemercier's ink :—

Yellow wax	4 parts
Mutton fat	4 ,,
Marseilles soap	12 ,,
Shellac	6 ,,
Lamp-black	1 ,,

to be well mixed warm. Rub down in a little distilled water for use.

Mechanical Intensification.—It was recently pointed out before the Société Française de Photographie that, if a film be treated with formalin after development, and then washed and placed in alcohol, it will contract more or less according to the strength of the alcohol and the duration of the immersion, and that by this contraction the negative is intensified. It is suggested that ninety-five per cent. of alcohol be used, to which forty per cent. of glycerine has been added. If the contracted film be placed in water, it will absorb the same, and extend to its original size and intensity. It has, of course, long been known that a film which has been allowed to expand in stripping with hydrofluoric acid gets thinner, but this is the first time that a contraction and intensification has been observed.

Mercury Toning.—Mercier pointed out, in his well-known work, *Virages et Fixages*, that gelatine and collodio-chloride prints can be partially toned with mercuric chloride with success. A writer in the *Bulletin de la Société de Bourgogne* now points out that such a toning process is extremely useful when the lights are slightly yellowed. If the prints have been toned with gold to a purple, they turn to a fine carmine. The procedure is merely to immerse the print, well washed after toning and fixing, in a bath composed of—

Mercuric chloride	1 grain.
Salt	20 grains.
Water	8 ounces.

It is stated that the results thus attained are quite stable after washing without any fixing.

Metol Developer without Alkali.—Kastner states that, if metol is used without any alkali, all plates will give absolutely clear glass, and that plates which have received various exposures may be developed in from ten to twenty-five minutes, with all details, with perfect immunity from fog. The developer may be repeatedly used, and gives prints on bromide paper with blacks equal to platinotype.

Mounting.—The following is given as an effective style by N. Ley: After stripping glazed gelatino-chloride prints from their supports, they are

trimmed to the required size. An oval or other suitable shape is cut out of a piece of matt celluloid, and two wooden blocks are prepared, one the shape of the aperture and the other the shape of the mask. The sheet of celluloid is laid upon the back of the print, and the shape of the aperture is traced upon it in pencil. This is then covered with the block of corresponding shape, and the margins of the print pasted. The mount having been previously prepared, by pasting upon it a piece of blotting-paper of the size of the print, the pasted print is transferred to the mount, and the second block, with the clear opening, is placed upon it. The print with the block in position is then passed through a press. The surface retains its high glaze in the centre, and the margins are matt.

Negative Varnish.—Herr Rottmann suggests the following varnish, which, he states, is very cheap and good: 500 parts of alcohol are freed from water by shaking up with potassium carbonate every quarter of an hour for twelve hours, and then decanting from the aqueous layer of the potash. To the spirit add 60 parts of sandarac, and 20 parts of Venice turpentine; allow to stand for several days and filter, and it is ready for use. The negative has to be warmed before applying the varnish.

Photo Reliefs.—Schmidt suggests the following method for making reliefs by photography: A sheet of glass is coated with bichromated gelatine, which is prepared by allowing fifty parts of gelatine to swell for some hours in water, melting and adding two parts of potassium bichromate dissolved in forty-eight parts of water. The bichromate should be added by lamplight, the gelatine solution being constantly stirred and kept warm meanwhile. The glass should be carefully levelled and warmed, and the gelatine should be poured into the middle of the plate, using a glass rod for it to run down to avoid air bubbles, and the rod may be used to distribute the gelatine if necessary. As much solution as possible should be poured on the glass without allowing it to run over the edge, and, when set, it should be dried in a warm place free from dust, and use as soon as dry, as it will not keep long. It should be printed under the negative until an equally dense negative gives a fully printed-out image on collodio-chloride paper. It is advisable to use direct sunlight, and allow the rays to fall on it as nearly as possible at right angles to the negative, as this ensures greater sharpness. The plate should after exposure, be well washed in cold water till full relief is obtained, and then placed on one side till surface-dry, and then brushed over with a soft brush with linseed oil, and then a thin cream of plaster of Paris poured on to it and allowed to set. The relief may be readily stripped from the gelatine, and may, of course, be used as a mould for electrolytic deposition of metals.

Platinum and Gold Toning.—Kastner suggests the following treatment for matt solio paper, and states that it gives pure black tones. The prints are first toned in—

Solution of chloro-platinite of potash (1:100)	30 parts,
Potassium chloride	2 ,,
Water	1000 ,,

till they assume a bluish-violet colour, and they are then further toned in a bath of—

Ammonium sulphocyanide	20 parts,
Citric acid	20 ,,
Chloride of gold	2 ,,
Water	1000 ,,

After washing, the prints are fixed.

Platinum Paper, Home-made.—In the *Mittheilungen*, Paul Hanneke recommends the preparation of this paper to attain special effect. For a support, use unsized Rives' paper, prepared with arrowroot. Take five grammes of arrowroot, and rub down in 200 c. c. of distilled water in a porcelain dish, heat and stir with a glass rod until the paste becomes a fluid, transparent mass. Brush it over the paper and hang up to dry. For the hot-bath process make the following solutions :—

1. Platino-chloride of potassium in 12 c. c. of distilled water	3 grammes.
2. Schering's solution of ferric oxalate	,,
3. Chloride of sodium in 10 c. c. of distilled water	1 gramme.

For a sheet of paper 50 × 65 c. take 4 c. c. of No. 1, 5 c. c. of No. 2, 3 c. c. of distilled water, and 6 drops of No. 3, and apply it to the paper with a wad or sable brush. The paper should be stretched upon a drawing board, and the solution brushed on in both directions. Dry in the dark at a temperature of 30 to 35° R. Paul Hanneke recommends this paper as giving softer results, but it will not keep for a great length of time.

Pyro-metol—In the following formula No. 1 is for use when it is desired to produce a strong negative ; No 2 is a milder form of the same ; No. 3 is the usual alkali solution.

No. 1.

Water	8	ounces.
Metol	18	grains.
Sulphite of sodium (crystallised)	360	,,
Pyro	22	,,
Bromide of potassium	4	,,
Citric acid	24	,,

No. 2.

Water	8	ounces.
Metol	18	grains.
Sulphite of sodium (crystallised)	360	,,
Pyro	22	,,

No. 3.

Water	8	ounces.
Carbonate of potassium	1	ounce.

For use, take one part of No. 1 (or No. 2, according to the kind of negative desired) to one part of No. 3, and add one part of water.

Quick Developers.—Professor Lainer gives an account of some experiments in this direction. In 1891 he gave some formulæ for hydroquinone and caustic soda, with addition of ferrocyanide of potash as accelerator. The special advantages were the highly efficient use of the hydroquinone and the energy of development, unsurpassed by any other method. Since then metol has been placed on the market, and is to be recommended where shadow detail is required with short exposure. But neither metol, nor any other rapid developer, should be used when the exposure is unknown. For portraiture in the studio, where the exposure may be measured with nicety, metol may be used to full advantage. The rapid hydroquinone developer is, however, in no way inferior to it. With some plates there may be a tendency to frill, in consequence of the presence of caustic alkali, but its accommodation to

exposure by dilution or the addition of bromide of potash are of value. Formula No. 3, given in 1891, was composed as follows :—

Solution A.

Water	1000 c. c.
Sulphite of soda	30 grammes.
Ferrocyanide of potash	90 ,,
Hydroquinone	10 ,,

Solution B.

Water	600 c. c.
Caustic soda	200 grammes.

For use, take 60 c. c. of A, 8 c. c. of B, and add 3 c. c. of a one per cent. solution of bromide of potash.

Development is complete in one to two minutes, or, if diluted with an equal quantity of water, three minutes will suffice. The developer is easily adjusted to different kinds of plates. With less caustic soda the negative is more brilliant and development slower. With more caustic soda the contrasts are less, and this may be increased until, with double the quantity, an absolutely flat negative is obtained. Sufficient solution must be used to avoid yellow stain, and for the same reason development must not be prolonged. To check further action, place the negative in a one per cent. solution of hydrochloric acid. Fix in a ten per cent. acid sulphite fixing bath. Yellow negatives may be cleared with ferridcyanide of potash, one gramme to 900 c. c. of water. Rewash and fix in a ten per cent. bath.

Reproductions of Drawings without a Camera.—According to Dr. Phipson, the following process is used in America for this work. A well-polished glass plate is coated in the dark with a mixture of—

Whites of eggs	2
Ammonium bichromate	46 grains.
Water	2½ ounces.
Ammonia	*q. s.*

The solution should just smell faintly of ammonia, and be filtered. The plate is first coated with this, and allowed to drain, and then coated again; and it is now dried by being moved quickly to and fro over a spirit flame. No coating can be seen on the plate when it is dry. It is exposed in diffused light under a drawing, engraving, &c., from one-half to one and a half hours, according to the thickness of the papers. After exposure, it should be taken into the dark room, and coated with a solution of—

White wax	1 part,
Venice turpentine	4 parts,
Benzine	36 ,, .

to which sufficient asphalt is added to give it a dark brown colour. The solution should be filtered several times through muslin. After coating, the plate should be allowed to drain. The plate dries very quickly, but still remains sticky, and should be dusted over with powdered graphite. It should then be placed in the dark, in a dish of cold water, and left from thirty to ninety minutes, and then gently rubbed with a soft pad. All parts not affected by light will be washed away, and a very good negative be thus obtained. If a zinc plate be used, an image is obtained which will stand etching with ferric chloride 50 parts absolutely, alcohol 100 parts.

Reproduction of Plans, Drawings, &c.—The following process is described by A. Carteron: A well-sized paper is selected and cut rather larger than the drawing to be copied. An ink is prepared by dissolving 8 to 10

grammes of gum arabic in 100 parts of water, and adding thereto a few drops of aniline blue or other suitable dye. The drawing is traced upon the paper with this ink and allowed to dry. The entire surface of the paper is then covered with printers' ink, by means of a roller or stiff brush, and well equalised. After a short interval the entire sheet of paper is immersed in water, and, by means of a roller or brush, passed delicately over the surface, the ink is disengaged from the traced lines. This is facilitated by the solution of the gum. The lines are thus represented by bare white paper, and the tracing may be used as a negative. If a very opaque ground is wanted, the background of printers' ink may be intensified by brushing on bronze powder with a badger's-hair brush.

Reversed Negatives.—Professor Lainer, gives the following particulars of a method for stripping gelatine plates. Having made some experiments with an addition of formalin to the above-mentioned hydroquinone developer (p. 903), noticed that the films were easily lifted, the use of formalin and caustic soda and for stripping seemed probably useful. The following solutions were prepared :—

A.	Water	200 c. c.
	Solution of caustic soda (1 : 3)	10 to 15 c. c.
	Formalin	4 c. c.
B.	Water	300 c. c.
	Hydrochloric acid	10 to 15 c. c.

Some old, unvarnished negatives were soaked in A for about five minutes, and, after rinsing, transferred to B. After soaking five or ten minutes, the film is loosened at either of the narrow sides of the plate with the fingers, carefully avoiding the least tear. If this should happen, begin again at the opposite end of the plate. When the film is loosened and turned over for the breadth of a centimetre, it may be stripped without further trouble. The film is turned over in the bath and adjusted to the plate, held by the upper corners and withdrawn from the bath. The plate is then stood up to dry, and after a short time blotted with filter paper to remove any drops of water that might cause blisters. Further practice will show if it is necessary to use plates coated with gelatine for the transfer, or if it is sufficient to secure the edges of the plates and films with a solution of gelatine. As there is very little enlargement of the film, sometimes scarcely any, the process might be used by photographers to make companion pictures in opposite position.

Sensitiveness of the Retina to Light.—Every one knows how, when a negative during development is raised to the gaslight to judge of its density, the eye will often become apparently fatigued or strained, and unable to judge of its characteristics. In a paper presented to the Royal Society, Captain Abney gives the result of his examination of this effect, and has formulated a rule showing its direction and extent. He finds that, 'the smaller the spot of illuminated surface, the less reduction of the intensity of the light is required, and that the amount of reduction of the light falling on the spot, which just produces no sensation of light, is expressed by a simple formula, $I = x^m$, I being the intensity, and x the diameter of the spot." From this will be seen the usefulness of that plan of negative judging, in which the negative is placed behind an opaque screen perforated with a small aperture, instead of being held up before the light and examined as a whole, rather than piece-meal, as it were.

Silvering Glass.—The following method of silvering glass was given in *Cosmos*:—

Silver nitrate	30 parts.
Ammonia	15 ,,
Distilled water	60 ,,
Oil of cassia	2 ,,
Alcohol	90 ,,

Dissolve the silver in the distilled water and add the ammonia allow to stand for twenty-four hours, and then add the cassia dissolved in the alcohol. Place the glass to be silvered in a horizontal position, and give it an edging of mastic, and flow the above solution over it till it is four or five mm. thick. In an hour a good thick film of silver will be formed, which can be washed in alcohol, dried in an oven, and varnish.

Solubility of Silver Chloride in Ammonia.—In a theoretical paper bearing upon the conditions obtaining during the admixture, under varying states of pressure, of ammonia and silver chloride, Mr. R. Jarry, in *Comptes Rendus*, gives a table of the solubility of silver chloride as follows:—

NH_3	·145	·294	·560	·624	1.177	1·636
AgCl	·049	·136	·344	·400	·468	·518
NH_3	2·816	2·98	3·019	3·243	3·456	3·748
AgCl	·659	·709	·725	·587	·477	·39

The remarkable fact is here shown that, up to a certain concentration, increase of strength in the ammonia solution brings about an increase in the amount of chloride dissolved, but that, when a certain point is reached, any further strengthening of the ammonia leads to a decrease in the silver chloride dissolved.

Stripping Films.—In Eder's *Jahrbuch*, Obernetter suggests the following method of stripping negatives with the aid of formalin. A mixture of 50 parts of formalin and 300 parts of water is made, and in this old negatives are bathed for from six to ten minutes, whilst freshly developed negatives only require from three to five minutes, after which time they should be well rinsed, and then either dried, or else, whilst still damp, coated with a solution of 200 parts of hard gelatine, which should be allowed to swell for twenty minutes in cold water, well pressed, and dissolved by heat in 1000 parts of water. When dissolved, 100 parts of alcohol, 20 parts of glycerine, and 20 parts of glacial acetic acid should be added. The negative should be coated to a depth of about one-twelfth to one-eighth of an inch with this solution on a levelled stand, and allowed to thoroughly dry, and then the edges cut round, and placed in a mixture of 50 parts of glycerine, 500 parts of alcohol, and 1200 parts of water, when it will soon begin to frill, and it may be stripped and transferred to another sheet of glass, or else used as a film negative.

Stripping Prints.—Frequently, when enamelling gelatino-chloride prints by squeegeeing them on to glass, it is found that they will stick and refuse to strip. If the glass is placed flat on the table, and the back of the print rubbed over with formaline till quite saturated, and then allow to dry, the print will readily strip.

Thiosinamine Toning.—According to Liardin the following mixture may be used for a combined toning and fixing bath with good results for gelatino-chloride paper:—

Water	100 parts.
Thiosinamine	100 ,,
Solution of chloride of gold (one per cent.)	100 ,,

The prints must remain in this bath about eight minutes. If the following chlorides are used, the various tones are obtained. Potassium chloride gives brown, salt yellowish brown; cadmium chloride gives first orange, then grey green; aluminium chloride gives greyish brown, yellowish brown, and greenish grey tones; nickel chloride gives yellowish sepia; cupric chloride in fresh solution, yellowish green; when old, grey green; platinum chloride, grey brown; potassium chloro-platinite, brown; gold and potassium chloro-platinite gives blackish violet; and aluminium and platinic chloride brownish sepia.

Three colour Projection.—According to M. Marguery the positives made in the usual way with bichromated gelatine can be coloured with the following solutions. For the red sensation :—

Carmine	5 parts.
Ammonia	15 ,,
Water	100 ,,

For the green sensation, a saturated solution of picric acid; for the blue-violet sensation, a ten per cent. solution of methyl violet.

Toning of Bromide Prints.—According to Valenta the following procedure will give any desired colour on bromide paper, developed with any of the alkaline developers. Ferrous oxalate must not be used. The print should be soaked in water in a flat dish till soft, then drain off the water and apply the following solutions as directed.

Solution A.

Uranium nitrate	5 grains.
Water	1 ounce.

Solution B.

Potassium ferridcyanide	4 grains.
Water	1 ounce.

Solution C.

Ferric chloride	4 grains.
Water	1 ounce.

For sepia brown tones, mix 9 parts of *A* with 1 part of *B*, and the toning should be allowed to continue for from six to ten minutes. The tones range through black to sepia, bistre, dark sepia, and Vandyke brown. For brownish red tones mix *A* and *B* in equal parts and tone for six to eight minutes. For orange red tones, mix 35 parts *A* and 75 parts *B*.

For bluish green mix *A* and *B* in equal parts, and tone till one image is a dark sepia brown, and then wash well, and then treat with a mixture of the part of *C* with 5 parts of water. Toning will take from two to four minutes, and the print should then be washed and dried.

For blue tones the print should be treated with equal quantities of *A* and *B* till a brownish red colour is obtained, and then washed and treated with *C*, when in about three minutes the desired tone will be reached.

Toning Gelatine Prints.—Mr. Otto Pfenninger recommends the following method: Wash the prints in one or two changes of water, then tone ten minutes in solution :—

Formalin	1 drachm.
Water	8 ounces

Wash again in one or two changes of water.

The formalin does not interfere in the least with the toning. Tone in the following bath :—

B.	2 ounces.
U.	$\frac{1}{8}$ ounce.
St.	$\frac{1}{2}$,,
G.	1 ,,

This solution is to be made up one quarter of an hour before using it in the named rotation, shaking well after each addition.

St. can be omitted in the winter time, or if the paper is fresh, as it does not interfere with the tone.

Make the bath up for the whole amount of sheets to be toned.

The prints will turn in this bath orange-red, and even appear stronger, then return to the original strength, and, if the high lights look clean, and the colour is about like a finished albumen print, the toning is finished. Time required, about two or three minutes ; even quicker if your paper is in good condition. Don't attempt to tone bluish, or your print will be over-toned, and appear dirty yellowish. Move the prints well in the toning bath, and rinse well after, or stained prints will result. Judge the tone from the surface, and not by transparency, as the uranium gives you ample range of colour. If that change to red does not take place with your paper, don't use your bath or change your paper. One grain of gold to the sheet is required, not more.

Stock Solutions.

B.

Borax	4 ounces
Water (ordinary)	80 ,,

Dissolve hot, but use cold.

U.

Nitrate of uranium (in sealed tube)	1 ounce.
Water (distilled)	35 ounces.
Nitric acid	$\frac{1}{4}$ ounce.

Keep in the dark, and don't expose to the light.

St.

Nitrate of strontium	1 ounce.
Water (ordinary)	30 ounces.

G.

Chloride of gold	15 grains.
Water	15 ounces.

Varnish for Collotypes.—Ad. Berold recommends the following:—

Powdered bleached shellac	25 grammes.
Alcohol	85 ,,
Ammonia	65 ,,
Boiling water	125 ,,
Glycerine	6 ,,
Dextrine	$\frac{1}{4}$ gramme.

The shellac is first dissolved in the alcohol, the ammonia is then added, and the solution well shaken at intervals. The water, to which the glycerine and dextrine are added, is boiled and gradually mixed with the solution of shellac previously poured into a basin or other suitable vessel. Well stir, and set out to cool. When cold, filter several times. The addition of a trace of borax

prevents any particles of shellac being thrown down. If large quantities are prepared, the dextrine may be reduced to one-thirtieth per cent. of the total quantity. The varnish keeps well, and, should it become too thick, may be thinned by adding hot water with a little alcohol and glycerine. To varnish collotypes so that they may have the same finish as albumenised prints, float them on the varnish in the same way as for sensitising paper.

Velox: an Ideal Printing Paper.—This is the title used by Mr. Maxmilian Toch, in referring to Velox, an American bromide paper. Says Mr. Toch, in *The Photographic Times*, 'Velox Carbon is called the paper of the future, and, as I have used every paper ever put on the market, I abandoned them all, even the use of platinum, for it. I expose Velox carbon to an ordinary 16-candle power gas flame for thirty seconds, about ten inches away from the flame, and keep the printing frame moving all the time so as to get a uniform impression. I then take the paper face up and put it in a wet tray, and paint the film side with a mixture of—

Amidol	60 grains.
Sodium sulphite	1 ounce.
Water	16 ounces.
Potassium bromide	1 grain.

All this I do by the same light about ten feet away from the gas, and sometimes I have a candle burning a foot away from the tray. The picture comes up instantly, and after noting that it is uniform—for, if it be not entirely uniform, I keep brushing the developer on the uneven parts—I plunge it face down in the acid hypo bath, and keep it moving for a few seconds, and the operation, with the exception of subsequent washing and mounting, is done. The developer I use gives intense blue-black prints, in every respect equal to platinum. Two things are necessary for absolute success with Velox carbon: first, the use of distilled water; second, cleanliness. It is necessary to become ambidextrous in order to have good results. I use the right hand for handling the paper, and for brushing on the developer, and I use my left hand for moving the print in the hypo. I drop the print with the right hand into the hypo, and then use the left hand for plunging and continued motion, after which I wash the left hand in a small dish of acidified water, and go on with the next. The whole process becomes mechanical in a short time, and the resulting prints are all that can be wished for. Sometimes I make over three dozen an evening, and, although the makers do not advocate extensive washing, I find that, where the acid hypo bath contains plenty of alum and is fresh, the prints do not suffer from being in the water all night. The glossy Velox is admirable for those who like glossy prints. I have used it to some extent, but I prefer the Velox carbon.'

Vignetting Glasses.—Rev. Arthur East says: Many amateur photographers may be glad of a simple way of making their own vignette glasses, and at practically no cost. We take a piece of brown paper and cut it to the shape and size of the vignettes required, and paste it on to an old and cleaned (or a piece of ground glass by preference) negative glass. This is put into a printing frame, the paper being *outside*, *i.e.*, farthest away from the back; then upon this is laid a sensitised plate, *reversed*, *i.e.*, the film next to the back of the printing frame; put on the back, and adjust the fixings, and expose to daylight or artificial light exactly as in making a lantern transparency by contact, only that during exposure the printing frame should be held in the hand and twisted in all directions to get a soft shading; then develop right through the film until it will develop no more, and you will have a perfect vignetting glass, so soft in shading that you may print with it in full

sunshine. Any old and doubtful plates may be used for this purpose; the exposure naturally must be suited to the kind of plate used, and in use the film side of the vignette glass should be farthest from the negative if a soft outline is required.

Warm tones on Lantern Slides and Transparencies.—Mr. Milton B. Punnett remarks: The following two methods of changing the tone of lantern slides and transparencies I have never seen published, and, as they are simple and in season, I hope that they will prove acceptable. In my experiments I used Seed's lantern-slide plates, developed with their metol-hydroquinone developer, and fixed in a chrome alum hypo bath. After fixing, plates were washed and *dried*.

DARK PURPLE TO BROWN.

Hypo	4 ounces.
Water	32 ,,

Heat nearly to boiling, and add powdered common alum, one ounce. Should be used cold. If used hot, it will deposit sulphur in the film. Bath works better if it is heated moderately hot several times, and allowed to cool. It should not be filtered, and improves with age. Place the dried slide in the bath until it is toned, which may take a number of hours. The longer it is in the bath, the browner it becomes. The tone is also dependent on the strength of the image. After toning, wash well and dry. The colour seems to be permanent; at least it has withstood the action of the sun for several days.

DARK BROWN TO BRICK RED.

Potassium bichromate	10 grains.
Common alum	150 ,,
Table salt	20 ,,
Water	4 ounces.
Nitric acid, c.p.	10 minims.
Sulphuric acid, c.p.	20 ,,

Bleach the image thoroughly in the above solution. This will take but a few minutes. Rinse well and tone in a strong solution of hydrogen sulphide.

Washing after Fixing.—Herr Gaedicke gives particulars of a series of interesting experiments. The plates were rinsed after fixing, and then washed by means of several changes of water at intervals of five minutes, the dish being rocked occasionally. The plates were 12 × 16, and 100 c. c. of water were used at each change. The amount of hyposulphite of soda taken up by each change of water was ascertained volumetrically, with a solution of 5·12 grammes of iodine and 15 grammes of iodide of potassium dissolved in 1 litre of water 1 c. c. of this solution will decompose 1 milligramme of hyposulphite of soda. The following are the results of two series of experiments, one made in the laboratory and the other at a meeting of the Deutsche Gesellschaft von Freunden der Photographie, Berlin:—

		Hyposulphite of Soda.	
	Iodine Solution used.	Laboratory Experiments.	Public Demonstrations.
1st wash water	16 5 c. c.	0·165 grammes	0·336 grammes.
2nd ,,	2·5 ,,	0·025 ,,	0·050 ,,
3rd ,,	10·5 ,,	0·005 ,,	0·008 ,,
4th ,,	0·1 ,,	0·001 ,,	0·001 ,,
5th ,,	0·05 ,,	0·000 ,,	0·0005 ,,
6th ,,	0·00 ,,	0·000 ,,	0·000 ,

The plate was washed film upwards; but, if inverted or upright, elimination would, of course, be more rapid. It may therefore be assumed that a plate with a thin film is thoroughly washed by five to six changes of water at intervals of not more than five minutes. A plate thus washed was intensified with bichloride of mercury. The deposit was blue-black, with clear shadows, and without any trace of brown indicating the presence of hyposulphite of soda.

Yellow Screens.—Fleck stated, in *Le Moniteur de la Photographie*, that the best yellow screen for erythrosine-sensitised plates is made by dissolving—

Acridine yellow	10 parts.
Alcohol	150 ,,

and—

Fuchsine	5 parts.
Alcohol	100 ,,

To a two per cent. raw collodion should be added twenty parts of the acridine yellow and seven to eight parts of the fuchsine solution.

RECENT NOVELTIES IN APPARATUS, &c.

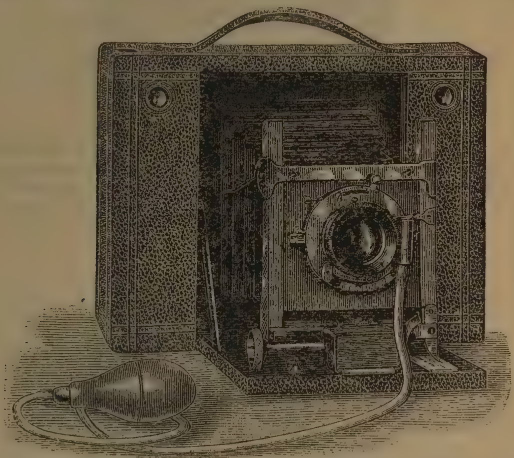
By The Editor.

THE NO. 4 CARTRIDGE KODAK.

The Eastman Photographic Materials Co., 115, Oxford-street, W.

This, one of the latest forms of the Kodak series, has been designed as a moderate-priced, high-class folding camera, suitable for various classes of work. When folded, it is only $3\frac{1}{8}$ inches in thickness, and, being easy to carry, is adapted for attachment to cycles. It takes rectangular 5×4 pictures; has a capacity of 12 exposures without reloading; the size of camera is $3\frac{1}{8} \times 6\frac{3}{8} \times 8\frac{1}{4} =$ 167 cubic inches; the weight, when loaded, 2 lbs. 12 ozs.; and the length of focus of the lens, $6\frac{1}{2}$ inches.

The No. 4 Cartridge Kodak takes either daylight loading film cartridges or glass plates, is fitted with a rapid rectilinear lens and pneumatic release shutter



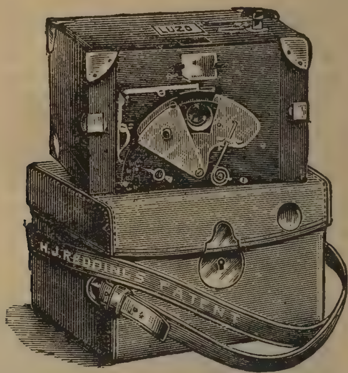
with iris diaphragm stops. This shutter has three speeds for instantaneous exposures; it makes short-time exposures by one pressure of the bulb, the shutter closing when the bulb is released, and makes longer time exposures by pressing the bulb once to open the shutter and again to close it. It may be operated by the finger trigger instead of the bulb when so desired.

The camera is also provided with a rising, sliding, and falling front, two view-finders, one for vertical and one for horizontal exposures, two sockets for tripod screws, and may be used either as a hand or tripod camera. It has an index for focussing, and when used with plates may be focussed on the ground glass if desired. The plate adapter can be put in place or removed in five seconds, and, when used with film, there are no projecting parts.

THE 'LUZO' ROLLABLE-FILM HAND CAMERA.

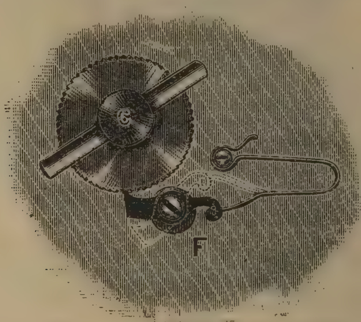
Redding & Gyles, 3, Argyle-place, Regent-street, W.

THE actual dimensions of the 'Luzo' hand camera are $5 \times 6\frac{5}{8} \times 4\frac{1}{4}$. The body is made of Spanish mahogany, and as a specimen of photographic cabinet work is one of the most excellently constructed and finished that we have seen. It is fitted with a rectilinear lens of very good defining power, and the



finder, of biconcave form, gives an image of remarkable brilliancy. The shutter admits of a variation of the exposure from time to instantaneous.

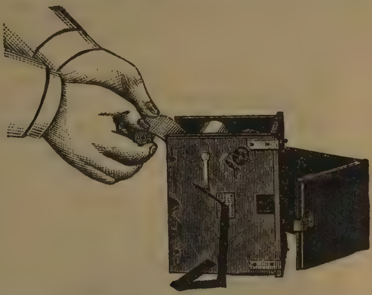
Fig. 1 shows the camera on its case, in which it may be placed for actual use, as the case is holed opposite the exposing and changing mechanism. The



Luzo takes rollable celluloid film, and, after an exposure has been made, it is necessary to wind off the exposed film by turning the handle C (fig. 2), on the top of the camera, slowly to the right, at the same time watching the spring indicator, which will gradually rise and return with a click ; the instant the click is heard, stop winding and press the button at the back of the camera,

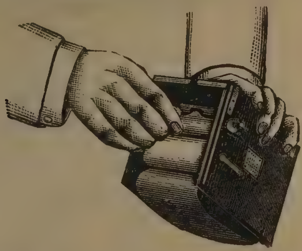
which marks the spaces between the exposures. By this means each exposed film is accurately measured off.

Fig. 3 shows how a portion of the exposed film may be rolled off in the dark room, and fig. 4 indicates the method of attaching the end of the film to



a metal cylinder in the camera, preparatory to winding up ready for exposure. The Luzo takes a spool of film for forty-eight exposures, the number of which is registered as they are made.

The Luzo is extremely simple in use. It demands only three operations for instantaneous work, which are thus summarised :—



1st.—Set the shutter.

2nd.—Hold the camera steady; see that the object appears in the finder, and press the trigger.

3rd.—Wind off the exposed film, and press the button which is at the back of the camera.

It is a well-thought-out, beautifully made, and practicable little instrument, which deserves to be popular.

BAKER'S POCKET CHANGING BAG AND FOCUSSING CLOTH.

W. R. Baker, Wallington, Surrey.

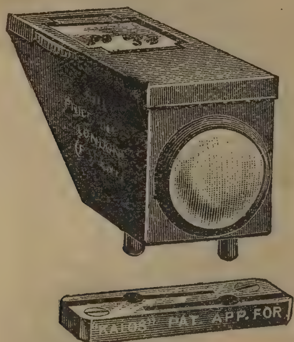
THIS pocket changing bag is made of several thicknesses of black and red material which are light-proof, and is furnished with an opening for the eyes, to which is attached a band of soft leather, which adapts itself to the face, and is retained in position by two elastic straps that fasten at the back of the head by means of a hook and eye. In front is a window of three thicknesses of red material that admits a perfectly safe light, the amount of which can be

regulated by fastening one or more of the hooks that keep up the blind, or by turning it to or from the light when in use. As no glass or other breakable material is used, the bag cannot be injured by being packed up in the camera case or pocket, and, the mouth and nose being outside the bag, the breathing is not interfered with. In the small size the plates are put in through one of the sleeves, which is afterwards closed by an elastic band. The larger sizes are made to open at the bottom, and close by means of a flap that fastens between the folds of material that form the sides.

THE 'KALOS' BRILLIANT VIEW-FINDER.

Price, Hill, & Co., 4, Berry-street, Clerkenwell-road, E.C.

THIS finder is constructed on the triple lens system, and, being optically adjusted, produces an exact reproduction, in miniature, of the view appearing



on the plate. It is fitted with a revolving wheel, which shows horizontal or vertical views at will. The finder answers admirably in practice and gives an image of a high degree of luminosity.

STAND CAMERAS WITHOUT FOCUSSING SCREENS.

Thompson & Co., 4, Bull's Head-yard, Manchester.

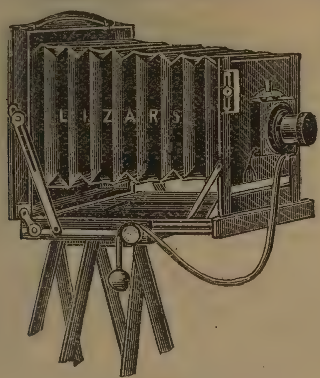
MR. MCKELLEN has drawn our attention to his system of providing stand cameras with a focussing scale and by the use of the Heywood finder, that is to say, an eyehole in conjunction with a rectangular frame the size of the plate used, dispensing with a focussing screen. The camera is set up in the ordinary way on its legs, and the lens placed in position. The correct focus is found for the nearest distances by the ordinary rack-and-pinion work. A line or pointer is marked on the travelling rail, and a corresponding line on the baseboard exactly opposite the pointer line. Several objects at various distances are focussed and lines marked on the baseboard opposite the pointer line as before. As many of these scales are marked as there are lenses in use with the camera. If now the camera is set up at any future time and the pointer line racked to any of the marks and the proper lens inserted, the camera will be correctly focussed for the distance indicated by the pointer. If a square bellows camera is being used, the frame of the Heywood finder may be attached to the front, and in this case it would be the full size of the plate. The sight piece will be

fixed on the top of the camera body. The camera is now racked out to the requisite distance, and the eye being placed to the sight-hole the composition of the picture can be seen through the frame in a much truer and more convenient manner than when a focussing cloth and ground glass are used. If a taper bellows camera is being used, a pocket folding finder will be convenient, and may be attached to the top of the camera body and placed in position when required. It consists of a miniature camera baseboard with a sliding middle, and to the back end of the latter the sight piece is hinged, so that it will fold down when not in use. To the front end of the former a wire frame is swivelled in such a way that, when erected and the eye placed to the eyepiece, the composition of the picture may be viewed. A scale is marked on the slide the figures of which represent the foci of various lenses from 4″ to 8″ for quarter-plate, and so on according to size of plate to be used. Cameras so constructed are to be placed on the market by Messrs. Thompson & Co.

THE 'NEW CHALLENGE' STAND CAMERA.

J. Lizars, 101, Buchanan-street, Glasgow.

THE camera is made of thoroughly seasoned Spanish mahogany. The back of the camera moves forward, on brass guides, to allow of the use of wide-angle lenses. It is also provided with swing back, reversing back, rising front, and long double extension bellows, the bellows being leather of the best quality. The double dark slide is made of the same material as the camera, is of book



form, with triple hinged shutter and automatic closing springs, and goes into the camera with one inch of slide. The lens is rapid rectilinear, working at f-8, and fitted with iris diaphragm. The shutter is of the Thornton-Pickard manufacture, with speed tablet and pneumatic release, which can be used for instantaneous photography from $\frac{1}{15}$th to $\frac{1}{90}$th part of a second. The shutter forms part of the front of the camera, but can be detached when desired.

THE 'MCKELLEN' STAND CAMERA.

Thompson & Co., 4, Bull's Head-yard, Manchester.

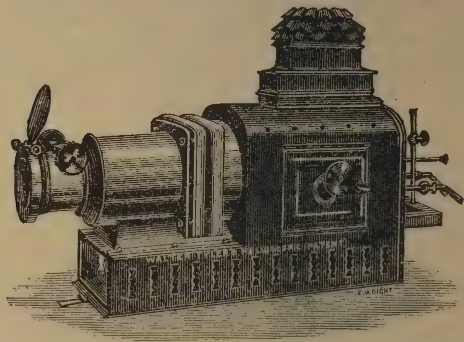
MR. MCKELLEN has shown us one of the latest patterns of his well-known stand camera, 12 × 10. It is an exquisitely finished instrument, and is constructed on almost identical lines to the camera which secured the Photo-

graphic Society's medal in 1884. Every required movement is embodied in the camera, one of the features of which is the great range permissible in raising or depressing the lens. The front may be so moved that the lens is easily placed opposite either the extreme top or bottom of the plate, should such an amount of displacement be required. This is accomplished by an arrangement of struts fitting on the front, that enables the fork to be telescoped up, and with it the front. These are all in three rising movements: one of the lens front, a two-inch side rise, and the telescopic arrangement referred to. The back part of the camera is a fixture, that is to say, it does not focus in, and with the use of short-focus lenses the baseboard does not cut off. The McKellen stand camera is the perfection of what such an instrument should be.

TYLER'S NEW HELIOSCOPIC LANTERN.

Walter Tyler, 48–50, Waterloo-road, London, S.E.

This lantern is suitable for use with either oil or limelight. It can be used for exhibiting in the smallest drawing-room or largest lecture-hall. The body has been generally remodelled, special attention being paid to the ventilation.



For the ordinary 4-in. condenser has been substituted a plano-convex compound condenser of 4½ in. diameter, thus increasing the amount of light. The special feature, however, is in the front objective. This lens is composed of a special portrait combination of 2⅝ in. diameter and fitted with patent shutter and grooves for tinting.

FITCH'S CELLULOID FILMS.

E. H. Fitch & Co., Seldon House, Fulwood's Rents, E.C.

The ever-increasing demand for Fitch's films is the best testimony to the excellence of the goods supplied by Messrs. Fitch & Co. There can be no doubt that the success which they have attained is in no small measure due to the long experience this firm have had in the manufacture of films, and there is no gainsaying the fact that, at the present day, there is no more popular film on the market. We hear that the cinematograph film now made by Messrs. Fitch & Co., is bidding fair to rival in reliability and popularity their ordinary cut films and we can unhesitatingly say that this is no more than it deserves, as it is a perfectly coated film, and as to the quality of the emulsion, we need only say that some of the finest photographs of the Jubilee procession were taken on the film,

OPTIMUS TELESCOPIC TRIPOD.

Perken, Son, & Rayment, 99, Hatton-garden, London.

Closed 14½ inches long; open, 49 inches high.

BEING made of aluminium, this camera stand is admirably adapted for cyclists, tourists, and others who desire a light and rigid tripod.

Although occupying exceedingly little space when closed, it extends to a full practical height when opened for use.

THE 'VRIL' CONTACT BREAKER FOR INDUCTION COILS.

W. Watson & Sons, 313, High Holborn, London, W.C.

THE 'Vril' Contact Breaker is the invention of Mr. James King, A.I.E.E., and it can be supplied to almost every make of existing induction coil. The construction is such that it gives a prolonged period of contact, affording the necessary time for the thorough magnetic saturation of the core, combined with a very sudden break. The results obtained with the ordinary vibrating break are yielded by the 'Vril' with fifty per cent. less battery power. With twenty-five per cent. less battery power than is requisite to run the ordinary vibrating break, fifteen per cent. more spark length is yielded by the coil if the 'Vril' contact breaker be employed.

The heating of the platinum contacts is greatly diminished, and does not become very appreciable with a long run of thirty minutes or more; liability to adhere is obviated, and the wear of platinum very much reduced. The speed of the make and break is controlled by means of an adjusting screw. A vacuum tube will often be found not to work at a certain rate of make and break, but if the frequency be altered it will at once run perfectly. The

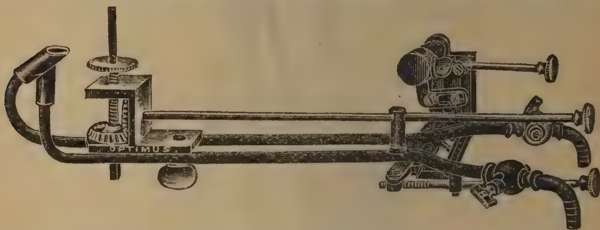
'Vril' affords facilities for varying the speed of the vibration exactly. It produces the same effect as a mercury interrupter, without any of the disagreeable trouble and annoyance that is caused by the latter.

When once set in motion, it requires no attention.

OPTIMUS ADJUSTABLE LIMELIGHT JET FOR PROJECTION LANTERN.

Perken, Son, & Rayment, 99, Hatton-garden, London.

An inexpensive, yet reliable, limelight jet capable of horizontal and vertical adjustments for centering the illuminated spot on the lime exactly in the optical axis of the lantern has long been required. Messrs. Perken, Son, &

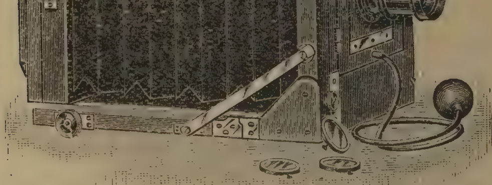


Rayment have introduced a jet with such an arrangement actuated by rods projecting beyond and at the back of the lantern. The mechanical movements are simple and strong, and therefore are not liable to become deranged.

THE 'ROYAL.'

E. & T. Underwood, 130, Granville-street, Birmingham.

A new camera of fine Spanish mahogany, and excellent workmanship and finish. A special feature in it is the shutter. This is a time and instantaneous

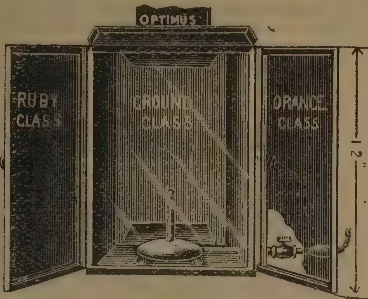


one of the roller-blind type, and works inside the camera. The camera front is formed as a panel and the shutter is attached to the inner face thereof, the setting and release arrangements working from the exterior. A smaller panel is removable, and permits the use of various lenses.

THE OPTIMUS DARK-ROOM LAMP.

Perken, Son, & Rayment, Hatton-garden.

The principles upon which this lamp are constructed are such as to render it of great practical service for dark-room work, and, having had it in actual use, we can testify to its utility. It is made for gas, and has a ventilating shaft, not shown in the cut. The interior is japanned white, by which means loss of

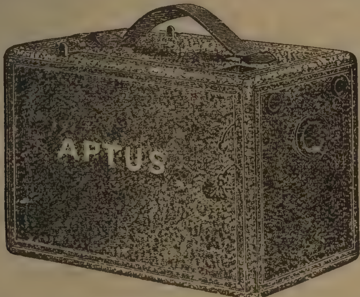


light is largely obviated. It will be observed that movable windows, of ground, ruby, and orange glass, are fitted to the lamp, an arrangement which allows of the colour of the light being varied at will, a great convenience to those whose photographic operations include the manipulation of bromide paper, ortho-chromatic and very sensitive plates, &c.

THE 'APTUS' MAGAZINE HAND CAMERA.

Sharp & Hitchmough, Dale-street, Liverpool.

We have been shown several photographs taken in the Aptus Magazine Hand Camera, with the lens at the full aperture, *f*-11, and the excellence of definition



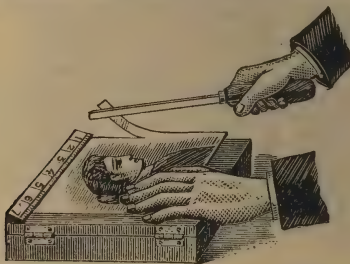
is so conspicuous that the camera could not have a better testimonial to its efficiency. It is, moreover, extremely simple to work, the sheaths being easily and certainly changed by a simple side-to-side movement on the top of the camera. The lens, as we have hinted, is of very good quality. The camera

is fitted with an automatic indicator; two finders, for vertical and horizontal pictures; iris diaphragms, working in front of the lens and controlled from outside the camera; time and instantaneous shutter; while the twelve sheaths take either as many plates, or twenty-four films.

THE 'PRIMUS' PRINT-TRIMMER.

W. Butcher & Son, Blackheath, S.E.

THE 'Primus' lightning print-trimmer consists of a polished mahogany board, with a sharp steel edge on one side, and a box-wood rule running at right

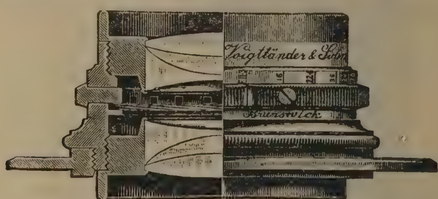


angles to it along the top. The trimming is done by means of a stroke with the cutting blade against the steel edge of the board. The trimmer is made in box pattern, as shown in the illustration, and thus is useful for keeping unmounted prints, &c., until required for use.

VOIGTLANDER'S LENSES, SERIES II. AND IV.

Manufactured by Voigtlander & Son, Brunswick, and 92, Hatton-garden, E.C.

SERIES II.—This series is designed for hand-camera and instantaneous work. The aperture has accordingly been opened out to the fullest available extent, viz., f-5·6. We were surprised to find that a No. 2 of the series, of $4\frac{3}{4}$ inches equivalent focus very well covered a half-plate, although, of course, the acme of definition was not obtained at the margins; by diaphragming down to f-8, however, the half-plate is well and easily covered. On the quarter-plate, at



full aperture, the definition is exceedingly fine and crisp, the illumination even, the field flat, and the errors of spherical aberration and astigmatism not apparent. This lens should prove an excellent instrument where short exposures are essential, for it appears to have been corrected so as to reduce the aberrations to the minimum.

Series IV.—This lens is intended exclusively for work of a wide-angle

character, where, of course, rapidity of exposure is not a desideratum. Its full aperture is f-11·3, and a No. 5 of $10\frac{1}{4}$ inches equivalent focus covers a 11×9 plate, thus embracing an angle of 75°. At f-32 a 12×10 plate is covered. The field of the lens is remarkably flat, and, as befits an objective of this character, its defining power is unexceptional. We could detect no astigmatism of the image. There is no doubt of the Series IV. proving an invaluable instrument for reproductions, copying architecture, and allied purposes. The Voigtlander lenses are noted for beauty of finish and purity of glass, and are well calculated to hold their own in the field of photographic optics.

KODAK BICYCLE CASES AND ATTACHMENTS.

The Eastman Photographic Materials Company, 115, Oxford-street, W.

The lightness and unbreakable character of film make the Eastman Kodaks particularly suitable for carrying on the cycle, and, in addition, the Company have devised special means for safely securing their cameras to the machine.

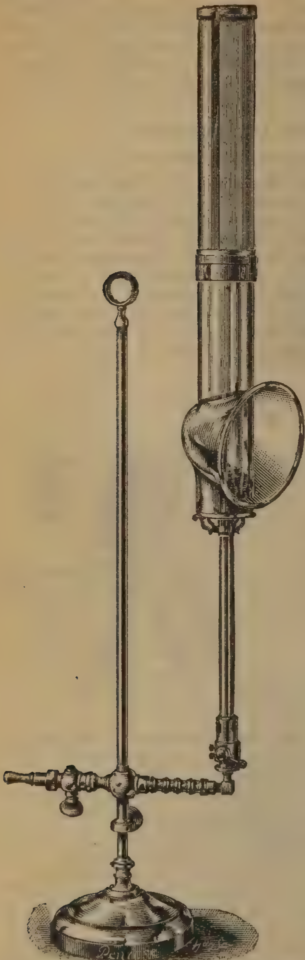
The carrying case for the No. 4 Cartridge Kodak is of very simple and efficient design. It is strongly made of wood, covered with fine-grained leather and lined with cloth, and is fitted with springs on the inside, which take up the vibration of the wheel and prevent injury to the camera. By means of two single thumb screws, which securely grasp the tubing, the case may be attached to the head of the machine, or suspended from the top bar, inside the frame. Although carrying a camera giving so large a picture as one five inches

by four inches, the case is only three and three-quarter inches in thickness, and in no wise inconveniences the rider when hung from the top horizontal bar, nor does it run much chance of injury in case of a fall. The clamps can be attached to any side of the case (except, of course, the door), and, in using it on the bicycle head, the door may be at the top, at either side, or directly in front, in which latter position the case presents almost no 'wind resistance.' There being no play at the points of contact with the machine, it will not wear the enamel. The outside measurements of the case are $3\frac{3}{4} \times 5\frac{1}{4} \times 8\frac{7}{8}$ inches.

The door fastens with a strong brass catch, which is very ingenious, and can be opened with one hand, yet cannot jar open, and will not rattle.

By means of a set of adjustable washers, the case may be held far enough in front of the bicycle head to allow for the free passage of a brake rod. It may also be provided with a lamp-bracket attachment. A set of washers are furnished with each case, and by their use the clamps will firmly grasp any

tubing from seven-eighths of an inch to one and a quarter inches, both inclusive. No wrench, screwdriver, or other tools are necessary in making the attachment.



PENROSE'S IMPROVED INCANDESCENT GAS LIGHT.

Penrose & Co., 8, Upper Baker-street, W.C.

THIS modification of the incandescent gas light has for its object the securing of a more actinic light from the ordinary Welsbach burner and mantle, thus rendering the form of lighting suitable for small workers who do not require such an expensive installation as the electric light.

The improvements consist essentially in conveying a larger volume of air to the burner, in more perfectly mixing the gas and air, in securing full combustion by using a longer chimney, and in concentrating the light by means of a parabolic reflector.

Messrs. Penrose use the Welsbach C burner, with the usual mantle and chimney, so that those who already have burners of this pattern can have the improvements fitted thereto.

The burner can be attached to existing gas brackets, pedestals, or a table stand is supplied, as shown in the illustration.

The improved light has been thoroughly tested against the ordinary burner, and has shown a very marked advantage. It is recommended for copying on dry plates, enlarging, printing bromide and other development papers, lantern-slide and transparency-making, and all kinds of contact printing requiring a brilliant and constant light.

THE STIGMATIC LENS (*f*-6).

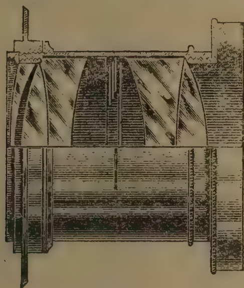
J. H. Dallmeyer, Limited, 25, Newman-street.

HAVING been given the opportunity of subjecting one of the above lenses to actual trial on the camera, we are enabled to pen the following notes on its practical performances.

Optical science, in the construction of modern photographic lenses, has a threefold problem to solve. This is, to provide objectives of large angular aperture, from which the errors of spherical aberration, curvature of field, and astigmatism have been eliminated. The first-named defect, which, practically considered, amounts to a general degradation of the image over the whole plane of definition, is one to which lenses of large angular

aperture are conspicuously prone, and to destroy its effects, while at the same time reconciling the property of flatness of field with the power of the lens to transmit oblique pencils of light as perfectly as those which pass through its centre, is obviously a task which, if accomplished, renders the lens that has been thus corrected of singular value and efficiency.

The Stigmatic possesses the optical virtues named in a pre-eminent degree. A lens of six-and-a-half-inches focus perfectly covers, at full aperture, a plate whose base line equals eight inches, and thus its great covering power renders it useful for wide-angle purposes. The definition over the whole field we found to be extremely fine and uniform. At the aperture named the lens is easily



focussed—a property we have hinted at in the preceding paragraph as not universally met with—and, so far as the camera test on vertical and horizontal lines was concerned it is quite free from astigmatic errors. By decreasing the aperture to a small extent, the covering power of the lens is increased to a remarkable degree, while the illumination is singularly even. The front combination transposed to the back cell forms a useful single lens of about twice the focal length of the compound.

We may add that the effective aperture (-6) is calculated on the English system. It will be readily understood, from the particulars here given, that the Stigmatic is essentially a 'universal' lens, that is, for the most rapid work, for copying, for landscape, architectural, and general purposes, it answers equally well, and therefore it is assured of high appreciation at the hands of all classes of photographers.

THE 'ABINGDON' ACETYLENE GENERATOR.

R. J. Moss & Co., Conduit-road, Abingdon.

THE principles upon which this generator is constructed may be understood from the following brief description :—

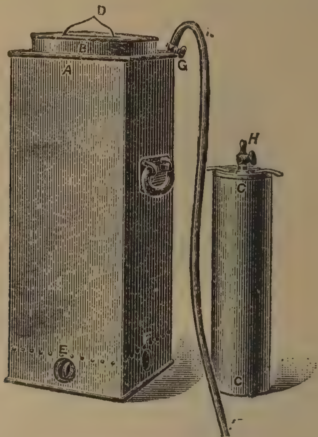
A is the water cistern ; B, the gas-holder ; C, the generating chamber ; D, the central tube from which C has been removed for recharging ; E and F, taps to let off the water from condensing chambers ; G, the gas outlet ; H, air tap for charging purposes.

The illustration represents the apparatus with generating chamber removed for recharging, while in actual operation, supplying light to the two burners ; part of the tube connexion is also shown.

The water tank is made square, partly to do away with guides and partly for convenience in transit ; when the gas is generated in C, it passes into B, through a down and up pipe connected by a condensing chamber, but is prevented from returning by a water trap ; this is one element of safety, the

volume of gas—even though small—being divided into two parts, each so small that an explosion (even if possible) could do no serious damage. This water trap also cools and purifies the gas. When sufficient gas has been made, the gas-holder, B, rises, lifting, at the same time, the carbide in C, when the active production of the gas ceases, to be resumed when the consumption allows the gas-holder to fall.

Should any excess of pressure arise in the generating chamber, that will



immediately rise from the gas-holder and relieve it, returning to the normal position when the excess of gas has passed into the holder. The apparatus can be started full working (two burners) in about two minutes, as nearly all air is expelled in the action of charging, and it can be recharged (if necessary), when in use, without interfering with the supply of gas or putting out the lights. The entire apparatus is made of twenty-four gauge iron, and afterwards galvanised ; this makes it perfectly sound, and obviates all risk of leakage, while the increased weight gives a good regular pressure. An arrangement for extending the sides of the water cistern prevents the water spilling over.

For lantern work, two sizes are made : 8 inches square by 21 inches high, charge, 1 pound, and 9 inches square by 24 inches high, with a charge of 1½ pound ; the latter has supplied eight burners at once for about three-quarters of an hour, so it is suited for photographic work.

THE WATKINS' HAND-CAMERA METER.

R. Field & Co., 142, Suffolk-street, Birmingham.

THIS neat and handy little meter has been specially designed for shutter work, and possesses the feature that it indicates half the exposure of other patterns of the Watkins' meters. The short instructions given for the use of the hand-camera meter display the principles upon which its construction is based. The numbers of the factors are engraved on concentric circles made in metal, as shown in the cut, and the resulting calculation is easily read off :

Hold the meter to face the light, pull out a fresh surface of sensitive paper,

HENLEY ROYAL REGATTA. 1897.

Taken with Smedley's "Up to Date" Camera and R. R. lens. Cheapest and best.

Collotype, Morgan & Kidd, Richmond.

By W. MARSHALL, Photographer, Henley-on-Thames.

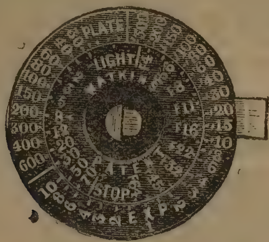
(Smedley's Blackburn.)

and count how many seconds the exposed tint in centre of meter takes to match in depth the tint alongside. This number is the light value.

The plate speed is given by number in the separate card of plate speeds.

Revolve face of meter so that the number representing speed of plate you are using is opposite the light value.

Then on the other half of circle the correct shutter speed to use will be found opposite the value of stop.



Or, if the shutter speed is decided on, the best stop to use will be found against it.

The shutter speeds are marked with a dash, $20 = \frac{1}{20}$.

Example: Plate 60, light 3, f-11 $= \frac{1}{20}$ shutter speed.

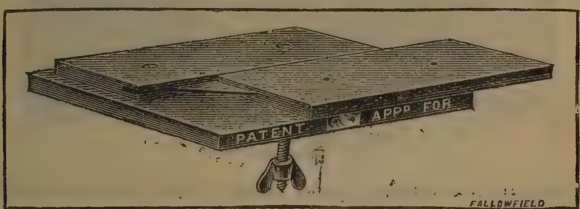
In sea views an exposure $\frac{1}{10}$ that indicated should be used, or a stop if $\frac{1}{10}$ the area; for seashore or snow views, $\frac{1}{4}$.

See that the light tested represents that falling on the subject. Do not test in heavy shadow when the subject is in open light. There is no need to use the meter for each exposure if light is fairly steady.

A STEREOSCOPIC ADAPTER.

Jonathan Fallowfield, 146, Charing Cross-road, W.C.

A USEFUL piece of apparatus, designed in accordance with the principle first suggested by the late Mr. Latimer Clark, for taking binocular photographs with a quarter-plate camera and one lens. It consists of an extra tripod table, having on its upper surfaces a parallel rule, one rule being fixed to the table and the other to the bottom of the camera employed. Thus exposures are



made in two different positions—one with the camera to the right, and the other with the camera moved across to the left side. The adapter is secured to the ordinary tripod top by means of the fly nut shown in the cut, and the camera is screwed on to the movable front by means of the holes shown. By the movement of the camera from side to side, two successive photographs at

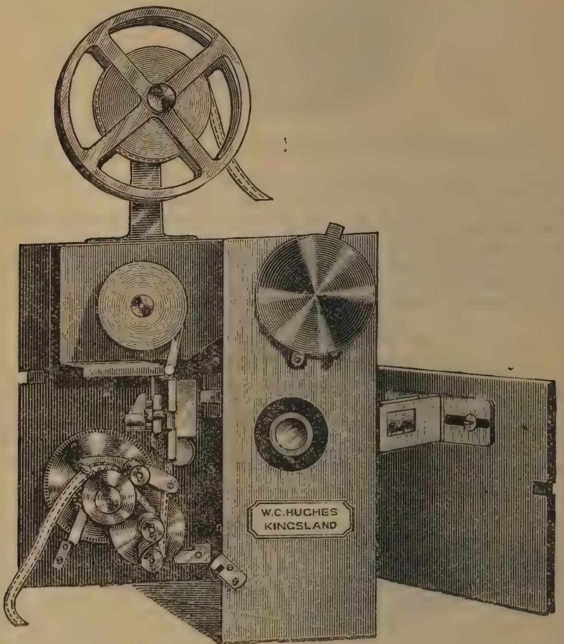
the theoretical distance of separation may be taken of the one view or object, and properly mounted prints from the negatives will give a true stereoscopic effect.

HUGHES'S MOTO-PHOTOSCOPE.

W. C. Hughes, 82, Mortimer-road, Kingsland, N.

AMONG the many advantages claimed for Mr. Hughes's Moto-photoscope are several of a unique character. The instrument is very portable, the case measuring only 11 in. high, $7\frac{3}{4}$ wide, and $4\frac{3}{4}$ deep. There is no flicker, because there is no shutter. As no light is cut off, there is perfect illumination. The machine runs easily and smoothly, and the films are never damaged or torn.

The film-winder is unique, as a film can be wound in less than half a



minute; and there is also a compensating shutter, to allow for the irregularities of the perforation.

The wear and tear of the film is practically *nil*, because it is drawn down by the rotary projecting arms and not the sprocket wheel, and the pressure is only about two pounds weight.

The entire mechanical parts are fitted to the door of the Moto-photoscope case, which can be easily opened to allow the operator to change his films,

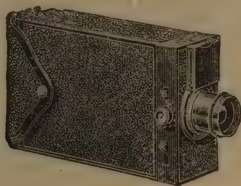
and, while this is proceeding, miniature pictures (specially made) can be exhibited. The effect of this prevents any break in the continuity of the entertainment.

Owing to the perfect balance of the rotary movement, there is no vibration. The machines are supplied to work Edison's gauge.

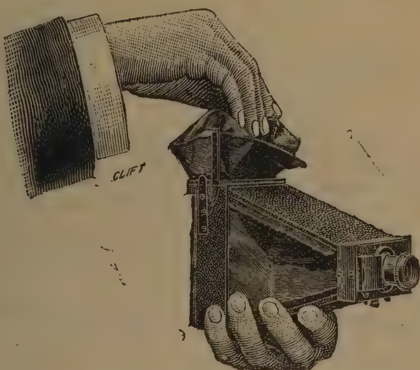
THE 'TRIAD' POCKET CAMERA.

George Houghton & Son, 89, High Holborn, W.C.

THIS is a decidedly useful and effective form of pocket camera. Closed up, as shown in the smaller illustration, it measures $6\frac{1}{2} \times 3\frac{1}{2} \times 1\frac{3}{4}$ inches. Its principal features may be thus summarised: It carries six plates, $3\frac{1}{2} \times 2\frac{1}{2}$ inches, in sheaths, which are contained in a magazine. This magazine measures only



$4\frac{5}{8} \times 3\frac{1}{2} \times 1\frac{3}{8}$ inches, and the two sides supporting the lens and shutter fold on either side of it when closed for carrying. The camera is opened ready for use in a moment, and, after the exposure is made, can be instantly closed. The plates are changed on the bag principle. The sheaths are numbered on the

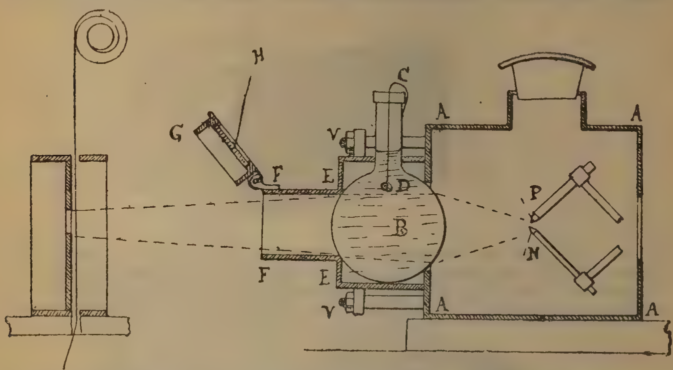


back, and it can be seen how many exposures have been made by means of an aperture, protected by non-actinic glass, in the back of the magazine. A finder, on the well-known principle of sight hole and cross lines, is affixed to the camera, which has a simple and effective time and instantaneous shutter. The Triad is an extremely compact, well-made little instrument.

LUMIÈRE'S SAFETY CONDENSER FOR THE KINEMATOGRAPH.

Fuerst Brothers, 16, Philpot-lane, E.C.

THE lens which has hitherto been used for projecting, and which served to concentrate the luminous rays, also concentrated the heat very strongly upon the film, and the film was liable to be damaged if exposed too long to this heat. Arrangements have therefore been made to avoid this, and it is now replaced by a so-called balloon condenser (a glass globe filled with water). Similar arrangements have already been used, in the shape of square glass troughs interposed between the condenser and the film, such receptacles having flat and parallel sides; but this has proved a very insufficient mode of avoiding the heat, in consequence of the difficulty of making the square trough water-tight, or sometimes, by an oversight, the water has been lost or escaped



AAAA, projecting lantern. B, condensing balloon. C, wire suspending a small piece of coke, D. EE FF, black enamelled metal box to fix the balloon up against the lantern by means of the bolts and nuts, VV. G, stop valve, provided with a movable ground-glass screen, H. PN, electric carbons.

without the operator having noticed it. The danger, therefore, becomes so much greater, as the operator, counting upon the trough, might leave the film stationary whilst it is being illuminated, a thing he would never do if he were using the condensing lens only.

With the balloon globe replacing the condensing lens, the rays of light are concentrated without any appreciable loss of lighting power, and it absorbs the greater part of the heat rays. During an hour of continued projection, the water comes to a boiling point without the least inconvenience. The temperature remains constant, and rises very little. The light, by this arrangement, is whiter, and the effect of the greenish colouration of the light caused by the condensing lens is altogether suppressed. If the balloon globe has to be removed for any reason, or if the water runs away or evaporates, no condensation of light rays takes place, and consequently the operator need not be afraid of any heat on the film. Thanks to this arrangement, it becomes impossible to commit serious mistakes, the whole concentration being produced by the neutral body which absorbs the heat rays.

To avoid projecting when the water is at boiling point, it is sufficient to suspend a small piece of coke (attached to a wire) into the globe, and the evaporisation of the water then goes on with the greatest regularity.

M'KELLEN'S 'INFALLIBLE' HAND CAMERA.

Thompson & Co., 4, Bull's Head-yard, Manchester.

THE leading features of the 'Infallible' may be thus briefly set forth. It takes either plates or films in sheaths, at the bottom corners of which are projecting pins, which fit in grooved guide plates on each side of the camera. At the end of each groove is a circular hollow, having a revolving circular disc mounted on a shaft. As the sheaths are pressed forward by back springs, the pins of the first sheath bear against the discs, while the top of the sheath

FIG. 1.

bears against a stop rail at the top of the camera. The discs have each a notch cut in them capable of receiving the sheath pins. The notches stand exactly opposite the grooves, and the pins of the front sheath, being pressed from behind by the springs, pass into the notches, where they remain till after the front plate is exposed.

Immediately after exposure, the key is turned steadily forward to the right as far as it will go. This movement causes the pins, which are in the notches,

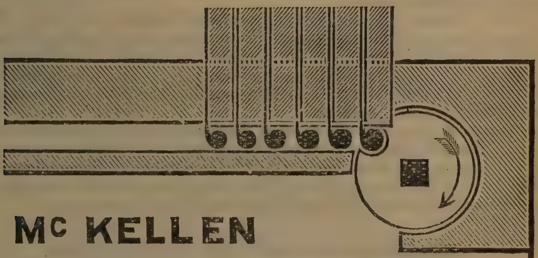


FIG. 2

to be carried forwards and downwards until the sheath has left the stop rail, when the top portion of the plate in its sheath falls forward into the receiver.

The discs still continuing their circular motion, the notches and pins arrive at the position when the pins are free to leave the notches; the whole sheath then deposits itself face downwards in the receiver.

As the sheath falls down, it is held in position by a gripper, which securely

holds each last sheath as it falls, so that there is no movement of the sheaths in the body of the camera. The illustrations, 2 and 3, clearly indicate the changing mechanism. An indicator, an automatic cut-off for preventing

FIG. 3.

access of light to the plates when it is desired to open the front of the camera, and an extremely simple and ingenious lever shutter are also fitted to the camera, which in use probably gives the photographer less to do or think about than most cameras.

THE 'INFALLIBLE' REFLECTING HAND CAMERA.—The Infallible camera is also adapted to work on the reflector principle. Its chief features are that a ground-glass focussing screen, the full size of the sensitive plate, lies on the top of the camera. A reflecting mirror is hinged at the angle formed by the sensitive plate and this ground glass. It is set in an oblique position, exactly bisecting the angle in which it is hinged, by drawing a cord down till a click is heard. In this position it intercepts all light passing through the lens, and so protects the sensitive plate.

A shutter, formed by two wings, is placed behind the lens. When the mirror has been set this shutter can be opened, and the rays from the lens, falling on the reflector, are thrown on the ground glass at the top, showing there the picture as it will appear on the negative. This shutter cannot be opened until the mirror is set, thus ensuring that the plate shall not be spoiled by accidentally opening the lens.

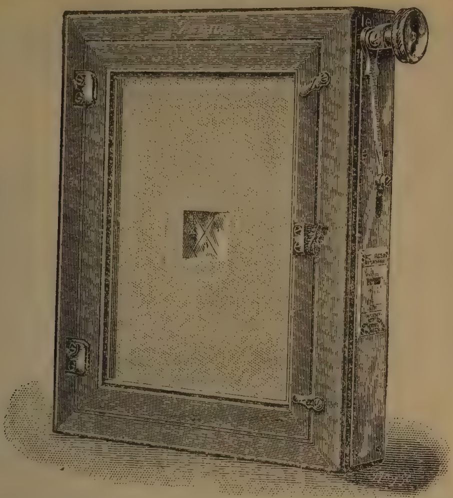
The exposure is made by pressing the button on the left-hand side of the camera. This sets in motion the reflecting mirror, which, revolving about its hinged side as an axis, rises to the top of the camera, suffers the rays of light from the lens to fall upon the sensitive plate for a definite period, and then closes the shutter behind the lens, thus completing the exposure.

THE PENROSE SCREEN AND PLATE-HOLDER.

Penrose & Co., 8, Upper Baker-street, W.C.

THE particular object Messrs. Penrose have had in view in making this slide has been to provide a means by which any one desiring to work the half-tone process on a small scale may be able to do so with any existing camera, instead of being deterred by the heavy expense of a special camera. The screen and plate-holder is made as closely as possible to the usual sizes of dark slides of ordinary cameras, so that with an adapter it will fit most cameras. The slide is somewhat thicker than an ordinary one, to allow for the mechanism

for moving the screen, and, to avoid altering the register of the ground glass, there is provided a separate ground-glass frame, which fits into the slide in the

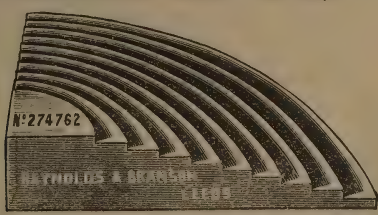


plane of the sensitive plate. When the focussing has been done and the screen adjusted, the shutters of the slide are reinserted and the plate put in.

AN X-RAY METER.

Reynolds & Branson, Leeds.

THIS little instrument supplies a definite means of comparing the actinic power of the radiations emanating from excited tubes used in X-ray work. A quadrant of aluminium is made in concentric terraces, the thickness ranging

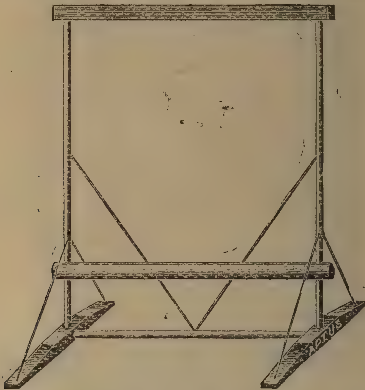


from one to ten millimetres. By placing this meter between the excited tube and a phosphorescent screen, the thickness of aluminium which the rays can pass through can be seen on the screen. The meter, therefore, gives an easy method of comparing the intensity of the rays emitted by different tubes, and the same tubes at different times.

THE 'APTUS' COMBINATION LANTERN SCREEN AND BACKGROUND.

Sharp & Hitchmough, Dale-street, Liverpool.

THE combination of lantern screen and background is absolutely opaque, the screen side being pure white, while the background side is coloured to a suitable tint for photographic purposes. The material of which it is made is

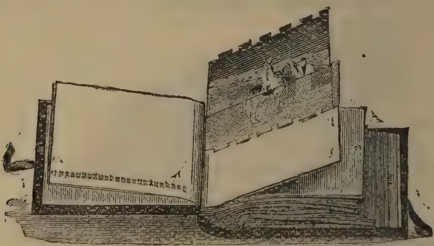


seamless. The illustration shows it mounted on a portable elevator, which may be readily set up or taken down. The latter piece of apparatus, which would be found useful by both professional and amateur photographers, is supplied separately; but the screen background is mounted on rollers, top and bottom.

BECK'S FILM-STORING NEGATIVE ALBUM.

R. & J. Beck, 68, Cornhill.

THIS handy little album includes within its covers a hundred numbered envelopes for holding film negatives, and a numerical index. The space

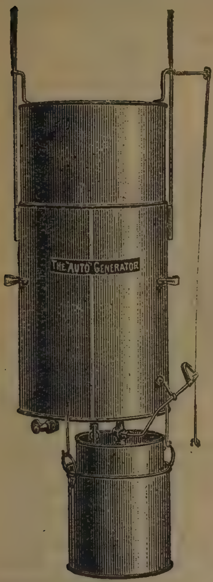


occupied is very small, and, the envelopes being made of specially thin paper, are transparent, so that it is not necessary to remove a negative from its envelope in order to identify it. Photographers who work films will appreciate this convenient storing album.

THE 'AUTO' ACETYLENE GAS-GENERATOR.

The Scottish Acetylene Gas Co., Glasgow.

THE chief advantages claimed for this form of apparatus for generating acetylene for photographic illuminating purposes are that the gas is cooled in the generator itself, and is therefore delivered into the gas-holder *quite dry* and ready for use; there is thus no trouble by the pipes choking with condensed moisture. There is ample storage capacity, and no gas is lost. The supply of gas is regulated to a *nicety* by the automatic regulator, exactly in proportion to the quantity of gas consumed. The supply of gas and light can be kept up continuously, as the generator can be recharged while the lights are burning. There is no danger as the pressure in no part of the machine ever exceeds four inches of water. The method of using the Auto generator may be understood from the following directions:—



The generator is packed inside the gas-holder. Fix the generator on to the cocks on the bottom of the container by the screwed couplings, and see that the catch at the bottom of generator faces out. Place the gas-holder in the container and slip the guide rods into their sockets. The regulating rod must be pushed up through the eye on regulating lever and secured to the bracket on top of gas-holder by the nut. Fill the container with water till it is just level with the top of gas-holder when quite down. Fill the water jacket. Fill seal can up to the inside with water. Shut all cocks. Place the charge of carbide, broken to about the size of a hazel nut, in the carbide box, and push it up into generator, securing it by a turn to the right. Lift up seal can and hook it on. Open the middle cock. Unhook the regulating lever and press it down. The machine will now make gas and regulate itself. When the charge of carbide is exhausted, the machine may be recharged as at first, taking care to shut the middle cock, and hook up the regulating lever. Should the machine be left set up at any time, hook up the lever till it is again wanted for use. To adjust the regulator, should the machine not be making gas fast enough, bend the spring on end of regulating lever inwards a little; if too much gas is being made, bend the spring outwards a little.

BAUSCH & LOMB'S RAY FILTER.

A. E. Staley & Co., 35, Aldermanbury, E.C.

THIS ray filter is designed to take the place of the yellow screen in orthochromatic work. It consists of two thin pieces of optical glass, the surfaces of which have been ground and polished plane and parallel. Between these plates is cemented a glass ring of uniform thickness throughout, forming a cell of proper depth, in which is contained bichromate of potash solution. The glass part is mounted in a neat metal ring, which protects it and holds the filter firmly in the proper position upon the *front of the lens*. It is recommended that the filter should not be placed at the diaphragm of the lens, as any refraction caused by it would be greatly magnified in the image; nor at

the back of the lens, being in that position inaccessible if it is desired to make a quick change for instantaneous work. The following instructions are given for changing the solution in the cell: Remove the metal ring which holds the cell in the mounting by inserting the tip of a blunt knife blade under it where the two ends meet, and lift one end out; carefully remove the cell from the mounting; lift off metal plate and rubber band, using care not to lose either; hold the cell with the holes down and remove the desired quantity of fluid with

the pipette; to refill the cell, hold the cell so that the holes will be uppermost, and introduce the solution through one hole until all the air and one drop of fluid have been expelled through the other; place rubber band over both holes; place metal plate on rubber band so that the two studs will be directly over holes, and, pressing between and beneath edge of glass discs, slide into the mounting. Do not allow the ray filter to freeze. With the filter a supply of the standard bichromate solution and a pipette are given, and Messrs. Bausch & Lomb have prepared an explanatory pamphlet, illustrated by photographs, taken with and without the filter, showing the advantages gained in the employment of colour-corrected plates when exposed to filtered light.

THE 'AMBER' CAMERA.

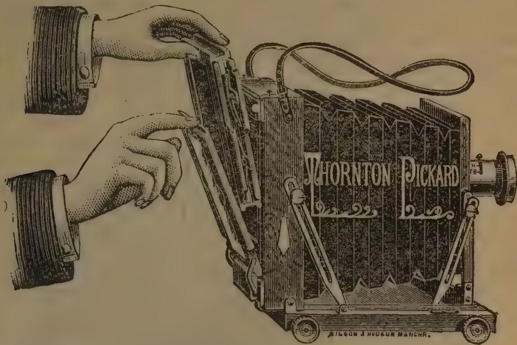
The Thornton-Pickard Manufacturing Company, Altrincham, near Manchester.

THE Amber is of the now familiar conical-bellows form, and is extremely light and portable. It is fitted with a turntable, and, by the simple pressure of two springs on the camera front and the elevation of the stretchers, the front folds down into the open base-board without detaching. The front has an independent rising movement, and can be inclined to give the necessary swing that may be required. The shutter—one of the firm's well-known blind instruments—is fitted behind the lens.

By means of screw adjustments, an extension of some seventeen inches is obtainable, while, on the other hand, the instrument, when racked in, is so compact as to allow of the use of extremely short-focus lenses. The back, of course, has a swing movement, and also reverses, while other special features of the camera may be briefly indicated as self-locking stretchers, a spring-hinged detachable focussing screen, a plump indicator, and a focussing scale

for hand-camera work, thus constituting the Amber really a photographic luxury.

Perhaps the most novel feature of the camera lies in the way in which the dark slide is manipulated. The slides are of 'solid' form, the plates being inserted from the front and firmly held by spring catches. The slide, as



shown in the illustration, slips in from the top between the screen and the camera. No side-push is necessary, and the slide is removed by merely lifting the spring bar at the top which holds it in position. We can testify to the fact that the movement is a very simple and effective one, working well in practice, and, when the camera is slung round the neck by means of a strap for hand-camera work, is a great convenience.

BECK'S FILM-DEVELOPING DISCS.

R. & J. Beck, 68, Cornhill.

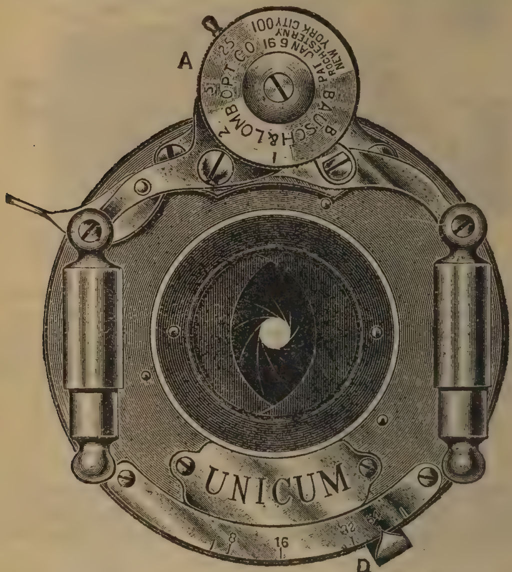
THOSE who have experienced the peculiar sensation of attempting to develop several 'cut,' or rollable film negatives in one dish will appreciate these little discs, which are designed to keep the films under the developer, and prevent

them from slipping one over another. They consist of thin metal discs with corrugated centre pieces which may be attached to the corners of the films. The discs are so small, neat, and handy, that a box of them should infallibly find a place in the amateur's dark room.

BAUSCH & LOMB'S NEW TIME AND INSTANTANEOUS SHUTTER.

A. E. Staley & Co., 35, Aldermanbury, E.C.

THIS shutter is the result of a lengthened study to produce a low-priced instrument, perfect in its working and construction. In appearance it differs very little from the shutter which has been now for some years before the photographic public. It has both pneumatic and finger release, and instantaneous exposures of various rapidities can be given. By adjusting the controlling dial,



any exposure may be given while retaining the pressure on the ball, or, by further adjustment, indefinite exposures may be given at pleasure. The shutter is of high-class workmanship, neat in appearance, and compact, fitting between the combinations of lenses. At the present time only two sizes are ready, viz., 5×4 and 7×5.

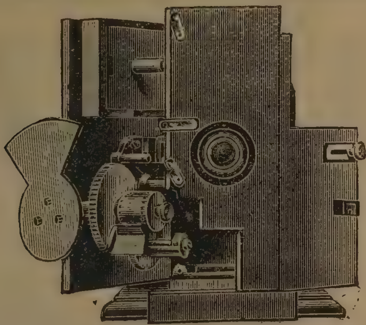
THE PRESTWICH MOTO-PHOTOSCOPE.

The Prestwich Manufacturing Co., 744, High-road, Tottenham.

THE Prestwich Moto-photoscope is very small and compact, and, besides being used as a camera, answers also, with a little adaptation, for either projecting the positives or printing from the negatives in contact. The essential movement, that for passing the film behind the lens, is simple, novel, and effective, and a brief trial of the machine as well as an inspection of the results convinces us that the instrument is a thoroughly good one—it is comparatively noiseless, does not tear the film, and in size is not much larger than many

hand cameras. Moreover, it is extremely well made and finished, and is cheap. An adjustable focal plane shutter is fitted to the camera, admitting of exposures ranging from the tenth to the 1500th of a second.

The illustration depicts the No. 2 Prestwich Projector, which is one of



five different models, designed to carry from 75 to 2000 ft. of film. The Prestwich Cameras and Projectors are made entirely of gun-metal and steel, and are fitted to best mahogany polished cases. For the longer lengths of film the automatic feed is fitted, so the film runs evenly all through. Detachable shutters are also an advantage, as some films show very much better without. Detachable sprockets made in several different gauges to suit the varying gauges are essential to perfect registration, the operation of changing taking but a few seconds.

The movement to all these projectors is a six to one, *i.e.*, the film is stationary five-sixths, and is being changed in the remaining one-sixth, so that the shutter used is but a very small one, and only one-sixth of the light obstruction, which reduces flicker to a minimum.

With the No. 2 Projector small title slides can be shown during the changing of another film, which can be rewound in ten seconds by a special winding device on the machine.

MALONI'S FLASHLIGHT APPARATUS.

G. Houghton & Son, 89, High Holborn, W.C.

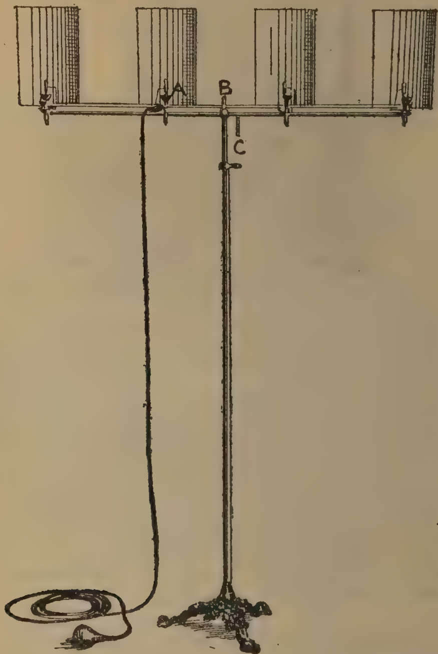
THIS method of making flashlight exposures is somewhat of a novelty. In the small cups shown on the cross rod, charges of a mixture of magnesium and a potash salt are placed, and ignition is effected by squeegeeing the pneumatic ball, which actuates a series of wires that have been heated in Bunsen flames. An exposure of about a fiftieth of a second is thus obtainable. The following are the instructions for using the apparatus :—

Fix up the apparatus as shown in illustration, attach the large rubber tube to C, and to an ordinary gas bracket, after first removing the burner. There must be a full pressure of gas, and sufficient supply to give a full-size flame to the four Bray burners; also to make the four Bunsen flames touch and heat the forked wires to whiteness. The igniting wires are correctly adjusted before sending out the machines, and their exact position when down in the cups should be carefully noted, as a guide when fixing in new ones.

The four lights should flash exactly together, and to cause this the fou

forks must all enter the cup simultaneously, but must not go within one-eighth of an inch of the bottom of the cups.

To make the exposure, place the powder in the cups—the quantity depends upon the amount of light required—about half full is enough for sitting figures (for full-length and groups use more), using plates of medium speed, with pyro-soda development, and lens aperture about f-8. Before charging



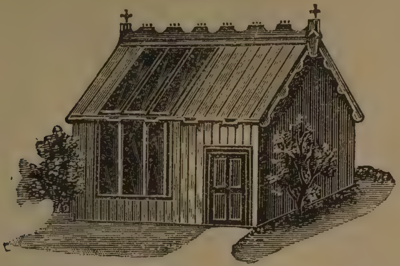
the cups, press down the lever at A till it is caught and held in place by the spring catch. Then, when ready to expose, uncap the lens and press the pneumatic ball, which may, for convenience, be hung on the camera stand. Owing to the amount of light given for the small amount of powder, there is comparatively little smoke, so that the apparatus can be used conveniently in a small room or studio if there is a small ventilation.

PORTABLE PHOTOGRAPHIC STUDIOS AND DARK ROOMS.

E. C. Walton & Co., Muskham, Newark.

MESSRS. WALTON, who manufacture portable buildings for horticultural and a variety of other purposes, also make a speciality of studios, specially built for photographic use. The illustration shows one of these studios, which is constructed of the best 3 × 2-inch framing. The sides and ends are covered

on the outside with $\frac{3}{4}$-inch planed, tongued, and grooved boards. The roof is partly of glass, which can be had of what proportion desired at no extra charge. If no special instructions are given, Messrs. Walton make about one-third of the roof glass, the remainder is lined with matchboard, and

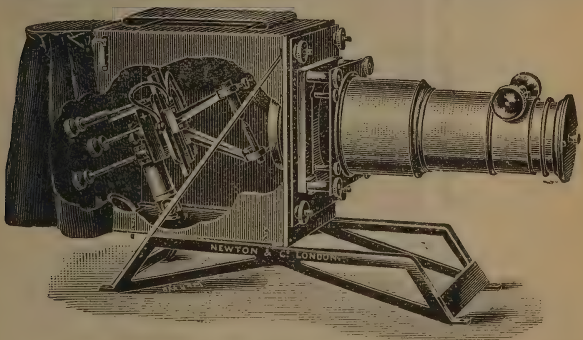


covered with patent felt that requires no tarring. The floor is of $\frac{7}{8}$-tongued and grooved boards, on 3×2 inch or 4×2 inch joists. Panel door with rim lock and brass fittings; sash made to open in roof or side as desired; ornamental barge boards, finials, glass, bolts, and other necessary ironwork are included. All the buildings are carefully put together before dispatch, and each section is marked for easy re-erection.

THE 'INDIAN' LANTERN.

Newton & Co., 3, Fleet-street, E.C.

THIS new lantern has been designed for use in the tropics and in hot, damp climates, where wood and iron warp and rust. It is made entirely of brass



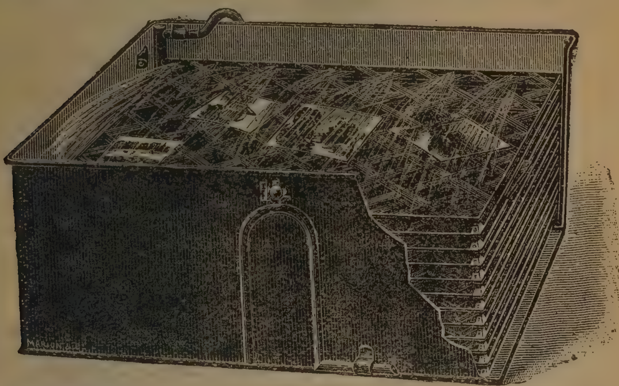
and is fitted with the finest long-range lenses, suitable for either electric or lime light, and the construction is such that the entire cover can be removed in a moment without disturbing the light or the optical portions. This lantern is specially intended for use in India.

The second illustration depicts the 'Primus' P-K or Drawing-room Table Lantern Screen. It gives a picture three feet square, and stands on the ordinary dining-room table. The screen is hung on a portable bamboo frame, which takes to pieces in a minute or two, and packs up into a neat box. It is very compact, and the total weight is only 3 lbs.

SIMPSON'S PRINT-WASHER.

Marion & Co., Soho-square, W.

THE improved Sectional Print-washer, patented by Mr. Simpson, and manufactured by Messrs. Marion & Co., is composed of a series of frames latticed with linen tape, on which the prints (or negative films) are laid and kept from contact with each other. Each frame has at one side a tube pierced with holes, and is connected with the supply pipe; the water rushes through these tubes and through the pierced holes, thus giving a good spray of water for each frame and the prints thereon. The frames are arranged a little



distance apart, and are contained in a tank, japanned inside and out, and also furnished with a syphon.

The outlet will act either as an overflow or as a syphon, in the latter case the little tap at the top must be turned off. By closing the outlet with finger *before* turning the tap, the syphon will start even with a very small flow of water. The system here adopted for washing prints should answer well in practice.

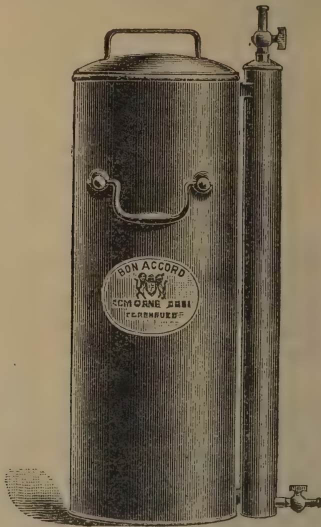
THE BON-ACCORD ACETYLENE GENERATOR.

A. & J. Smith, 23–25, St. Nicholas-street, Aberdeen.

THIS generator consists of an outer vessel, into which fits loosely a gas-holder, within which is a perforated tube, removable for charging with calcium carbide. Attached is the condenser, having two taps, upper and lower.

The method of using the generator will be understood from the following directions:—Lift out the gas-holder and fill the outer vessel with clean water up to three inches from the top. Take out the perforated tube, and three-quarters fill it with broken calcium carbide, slip the tube up the guide rods of the gas-holder, and, when it is as far as it will go give it a quarter turn and

pull down, when it will be found to be fixed. Open the upper tap, and place the gas-holder in the outer jacket. It will sink a little, and then rise again. As soon as it begins to rise shut off the tap. Connect the burner by means of rubber tubing, open the upper tap and the burner tap, and apply a light to the



burner. The presence of air in the apparatus at first causes a blue frame. After a few minutes the light will be brilliant and dazzling. Regulate the light with the burner tap until the best effect is obtained. The light can then be centered in the lantern in the usual way.

The generator does not give off any smell, and a light of 200 candle power is said to be obtained with it.

A SLIDING-FRONT COMBINATION CAMERA.

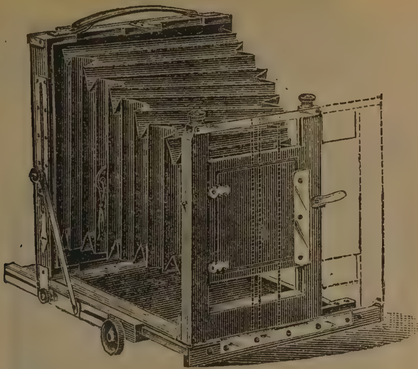
Holmes Bros., 33, Barnsbury-road, N.

Stereoscopic photographers will appreciate the novel method of giving the lens front a lateral movement, which is a feature of this camera. The sliding arrangement is capable of travelling from one side of the camera to the other, or it can be fixed in any desired position by clamping rods. This lateral movement, applied to a conical-bellows camera, renders the instrument capable of taking two quarter-plate pictures on a half-plate. The dark slides are also adapted to take stereoscopic plates.

To secure accuracy in fixing the front in position for binocular work, it is marked in the two places on which the lens must be centered, and is stamped with the word 'centre.'

The body has reversible back, and can be used with wide-angle lenses. It measures $1\frac{5}{8}$ inches thick when closed, and 9 inches square over all, and extends 16 inches; the weight is about 3 lbs.

A sliding panel is fixed on the back of the camera for covering up one half of the plate when an exposure is made. Obviously this system only allows of

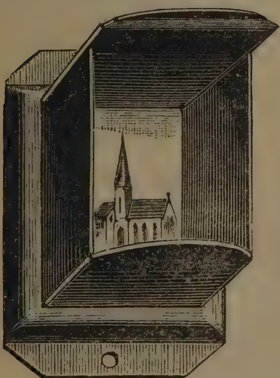


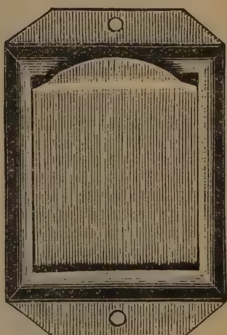
the stereoscopic reproduction of objects not in motion; but, of course, it can be employed so as to obviate the transposition of the prints in making the stereoscopic slides.

THE BIRKBECK FINDER SHADE.

E. G. Platt, Birkbeck-road, Dalston, E.

THE illustration depicts a useful adjunct to a finder, viz., a collapsible shade, which is shown open. When closed, by the mere raising of one flap, the whole



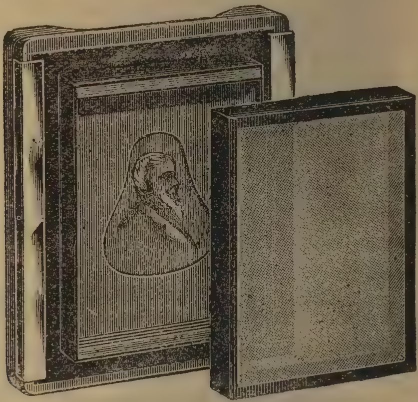


immediately springs up into a firm position. The flap closes down flat by a slight pressure. For excluding extraneous light from the finder image this four-sided collapsible shade should be found of considerable service.

SALMON'S ADJUSTABLE VIGNETTER.

Marion & Co., Soho-square, W.

UTILITY and efficiency are the characteristics of this extremely handy vignetter. Two thin metal strips are screwed on to the printing frame, and a light grooved frame, for holding the vignetting cards and the diffuser, readily slips into the grooves. The vignetting cards can be easily changed, inclined

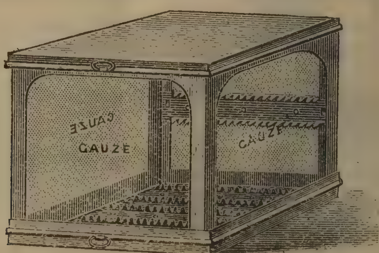


at an angle or at a fixed distance from the negative. The vignetter is useful for silver or bromide vignettes, and is excellent for printing from thin negatives when vignettes are not required, using the light-diffuser only and without the vignetting card. The vignetter may be used in connexion with any ordinary printing frame, and does not interfere with the general use.

THE D. A. DRYING BOX.

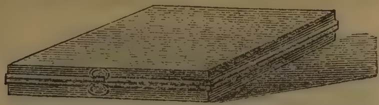
David Allan, 157, Whitfield-street, Fitzroy-square.

THE frame of this drier, when not in use, collapses and folds flat. It is



covered with fine gauze, which effectually excludes dust and other particles. Inside there are two rows of grooving for supporting the plates. It

manifest that plates may thus be dried in the open air, and the operation consequently very greatly accelerated. The drier is beautifully made in

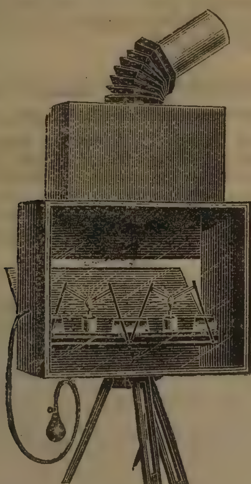


japanned metal, and is one of the neatest and handiest photographic devices we have recently seen.

SALMON'S PORTABLE MAGNESIUM LAMP.

A. Salmon & Son, 169, Hampstead-road, N.W.

THE principle availed of in this lamp, which is glazed with corrugated glass, is the ignition, by pneumatic means, of strips of magnesium supported on metal arms. The lamp is noiseless, and all the smoke and smell produced by combustion of the magnesium are conducted away through any available outlet in



the studio by a portable telescopic chimney, which can be inclined in any direction. The lamp shuts up in cabinet form when not in use, the chimney packing with the stand. The lamp is capable of giving a series of powerful lights, each of several seconds' duration, or the whole series can be fired simultaneously, and thus a very short exposure may be obtained.

THE 'YALUS' HAND CAMERA.

Adams & Co., Charing Cross-road, W.C.

THIS is a low-priced hand camera of great excellence. Among its principal features may be mentioned a self-capping ever-set shutter, which admits of time and instantaneous exposures, and is regulated for various speeds, two

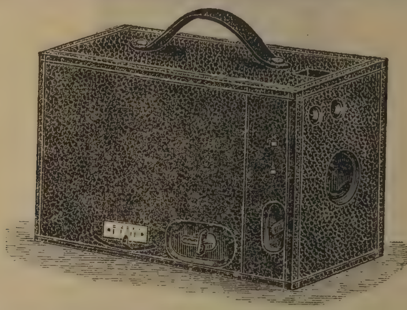
finders, showing a brilliant image, and an excellent single lens. It takes sheaths for plates or films, and this brings us to the changing method, one of the simplest, as it appears one of the most certain yet devised and introduced.

The sheaths bear against an inclined plane, the consequence being that the front sheath is always elevated above the rest, and, being readily grasped through a cloth bag, is easily removed to the rear, No. 2 sheath then being ready, and so on throughout the twelve.

THE 'BULL'S-EYE' AND 'BULLET' KODAKS.

The Eastman Photographic Materials Co., 115, Oxford-street.

THESE two little cameras, though built on the same lines, yet have one important point of difference, for, whereas the Bull's-eye is designed exclusively for taking cartridge film, which can be unloaded and reloaded in daylight, the Bullet is also adapted for glass plates in dark slides. In the latter case, the change from film to plates can be made in a few seconds, a door in the side of the Bullet opening to receive the plate-holder. The No. 4

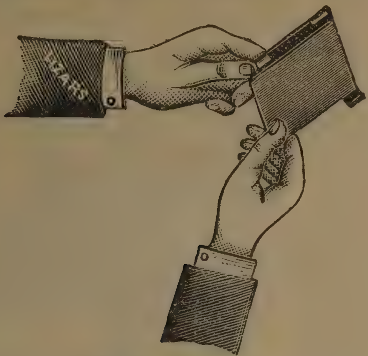


size of the Bull's-eye and the No. 4 of the Bullet take 5×4 pictures, and each camera has two view-finders and two sockets for the tripod screw, so that vertical and horizontal pictures can be taken. There is also an accurately adjusted focussing scale. The single achromatic lenses are of excellent quality, and have a set of three stops. Snap-shot or time exposures are given by means of a rotary shutter, which is always set, and is actuated simply by pushing a lever to the right or to the left, alternately. Near the exposure lever are slides for controlling stops and time movement.

THE 'CHALLENGE' FILM CARRIER.

J. Lizars, 101, Buchanan-street, Glasgow.

THIS is a simple and easily used carrier for films, which furnishes the acme of convenience. At the outer edges of the carrier are movable catches which,

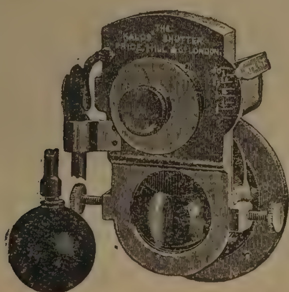


when the film is placed in position, are turned back and hold the film securely in contact. Those who employ cut films will appreciate this excellent little carrier.

THE 'KALOS' SHUTTER.

Price, Hill, & Co., 4, Berry-street, Clerkenwell-road, E.C.

THE 'Kalos' shutter is fitted with a pneumatic speed regulator, which ensures all exposures being given with exactness, and is constructed entirely in aluminium. Both time and instantaneous exposures can be given by altering

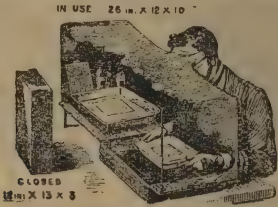


the lever to the desired speed. There is a noticeable absence of vibration in the movement of the shutter, which clamps on to the front of the lens mount, and is extremely light and portable. It is an effective and ingenious little shutter.

BAKER'S TOURISTS' DEVELOPING TENT.

W. R. Baker, Wallington, Surrey.

THIS is made in polished mahogany, and is provided with the same kind of eyepiece that the changing bag has. When open it is about 24 in. long by 10 wide, and 12 high, without the zinc sink, which is $2\frac{1}{2}$ in deep. When closed, it forms a box 12 in square by $3\frac{1}{2}$, in which the collapsible parts

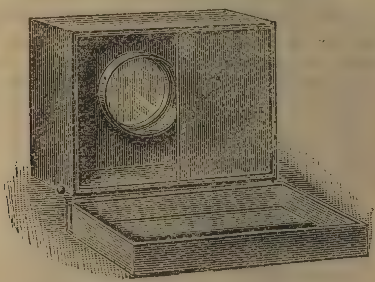


of the tent occupy so little space that there is still room for one dozen half plates, two developing dishes, two six ounce bottles, and several small articles. The sides of the tent are composed of perfectly opaque material, and as the light can only enter by the red window, which is guarded by a blind, its amount can be regulated as desired.

TYLAR'S DUPLICATOR.

William Tylar, High-street, Aston, Birmingham.

THIS is a simple device for enabling a person to be photographed in two positions on one plate. It fits on to the hood of the lens, the cork back being



cut out for the purpose. The sitter is posed and an exposure made; then the sitter's position is altered, and the sliding partition pulled over and the second exposure made. The lid acts as a cap, and is used after each exposure.

THE MOTORGRAPH.

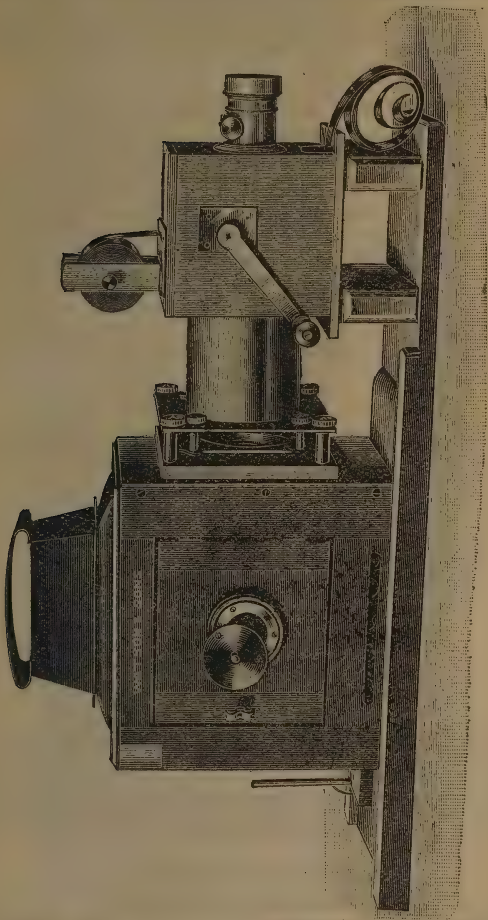
W. Watson & Sons, 313, High Holborn, W.C.

THE principal feature of the Motorgraph is that it is contained in a box, the dimensions of which are $6 \times 4\frac{3}{8} \times 5\frac{1}{2}$, and that it can be attached to any form of lantern. It is designed for photographing as well as for projecting. It is steady, and free from vibration. The shutter permits of an exceptional

amount of light being passed. The sprocket wheel fits the 'Edison' perforations, this gauge being the universally adopted one.

The instructions for working are as follows:—

To attach it to an ordinary magic lantern, the front lens of the lantern



must be removed, and the Motorgraph placed close to the front tube, from which the lens has been detached. It will be well that the lantern be mounted upon a baseboard, having two fixed blocks at one end, on which the

Motorgraph can be fixed to the exact optical centre of the lantern. To insert the film, the film is placed upon the centre pin as shown in illustration, and is pushed through the slot in the top of the machine. While this is being done, a flap, which is held in position by a spring, must be pulled back, the film passing between this flap and the fixed metal strip. The film should be gently urged downwards until it reaches the sprocket wheel; the spring flap is then closed, and the handle turned until the film comes through the front of the machine. The position of the picture can then be adjusted by again holding back the spring flap.

THE 'ELLIS' PORTABLE STUDIO STAND.

W. Watson & Sons, 313, High Holborn, W.C.

This studio stand, made to the design of Mr. Alfred Ellis, consists of a complete tripod of the usual shape, with triangular top, in which form it is available as an ordinary field tripod. In addition, a studio table top is supplied, with tilting and lowering movement by means of an endless screw, and a threefold base for strutting the legs firmly apart, this base being fitted with castors covered with indiarubber, on which the whole structure moves.

The legs having sliding adjustment, the camera can be worked either very low down or at its fullest extent. The centre of the triangular top is turned out so that a camera can be placed upon it with the lens projecting through. This will be found very convenient for photographing jewellery and other objects requiring even illumination. The height of the stand is 4 ft. 6 in., and when shut down 2 ft. 6 in. The total weight with studio top is 13 lbs.

LUMIERE'S CINEMATOGRAPH.

Fuerst Brothers, 17, Philpot-lane, E.C.

Messrs. Fuerst Brothers recently gave us an opportunity of examining in detail the mechanism, which is excellent in all respects, of the Lumière Cinematograph, of which the most essential features are here described.

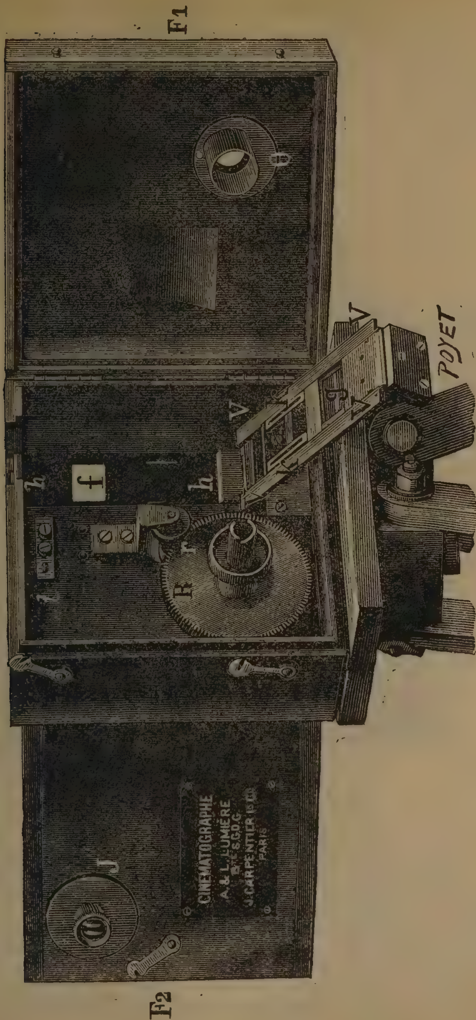


Fig. 1.

The Cinematograph is actually composed of (1) the eccentric crank, R, (fig. 1), (2) the sprocket frame and sprockets. Whilst the crank rotates once, the eccentric transmission rotates eight times. The crank is manipulated by a handle which the operator must turn very regularly, about two turns per second, consequently the eccentric transmission will make sixteen turns per second. Above the crank, R, is a small friction roller, *r*, coated with leather on the surface. The use of this is explained later when obtaining the negative. The triangular eccentric is fixed behind the transmission, and moves the sprockets continuously in a circle. The movements of these sprockets during

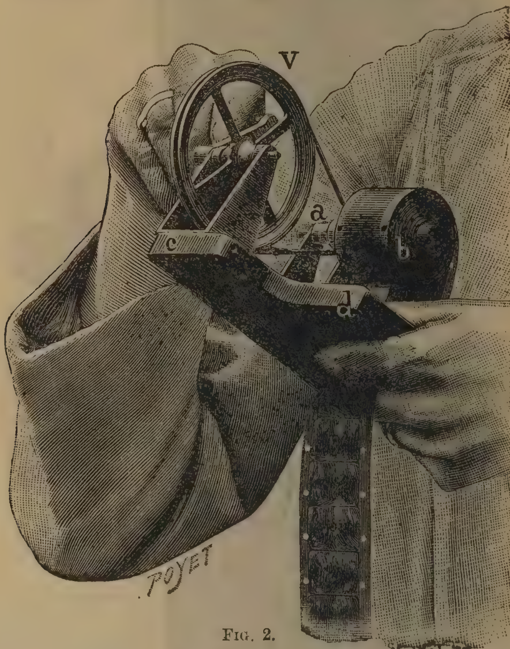


FIG. 2.

their rotation are slightly deformed, so as to engage the film in one case, and in the other case to disengage it. At the end of the crank is fixed a shutter, which is composed of two light metallic sections which can be regulated so as to increase or decrease the size of same. The nut keeping this shutter in position *turns to the left*, and not to the right, as is usual.

The sprocket frame is made of thin steel, having a rectangular opening in which is inserted the triangular eccentric. It has at its upper and lower extremity two rectilinear guides, allowing easy sliding without, however, giving any play. In this manner the frame, under the action of the eccentric, receives an alternative movement. On the side and horizontally the frame is extended for the purpose of holding the sprockets. These sprockets are guided perpendicularly in a most perfect way.

Respecting accessory mechanical parts, V V V V (fig. 1) shows the bridge-like arrangement on hinges which can be lowered or kept in position by a latch.

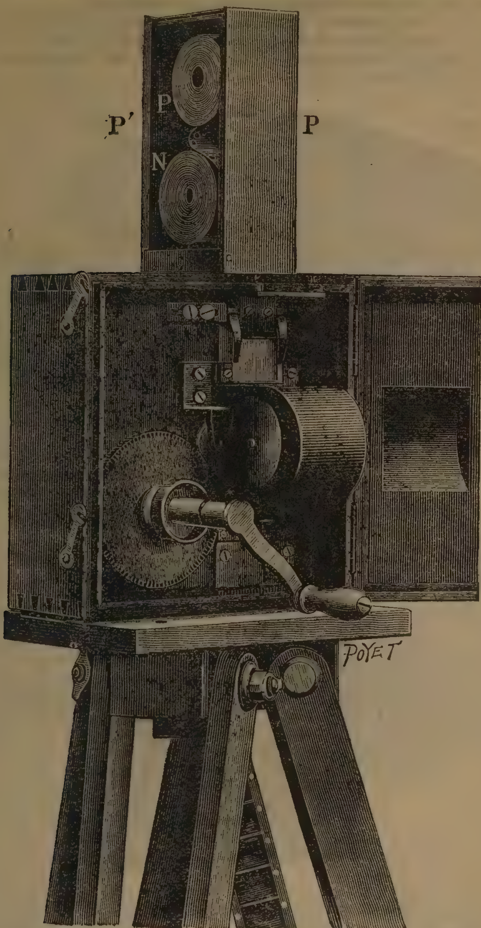


Fig. 3.

This bridging has two springs, KK, within which the sprockets play. It also has a square glass, G, provided with springs, which presses lightly on the film when operated, so as to avoid any damage to the film in case of any unforeseen

accident. The wall, H H, is provided with velvet to keep the film from deteriorating, and on the upper part of this wall is a rectangular window, F, which allows the image to be projected or photographed.

The whole of the camera is mounted in walnut. The circular hole, J, allows either the insertion of the negative or projecting lens, and the circular opening, O, allows the insertion of the handle when the camera is closed and is used for photographing.

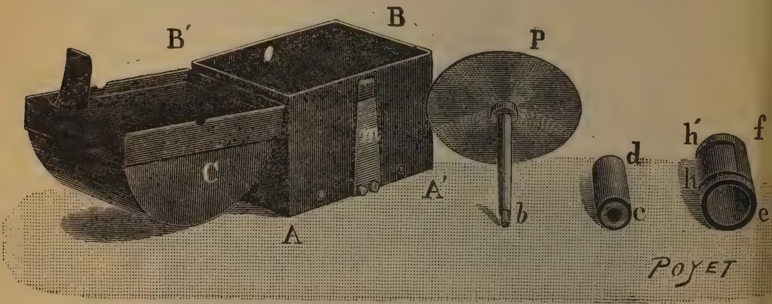


FIG. 4.

To obtain the negative it is necessary to have a tripod, a dark slide, a receiving slide, and a film-roller (fig. 4). The dark slide is made of wood, and contains the film before exposure. The receiving slide is entirely made of metal, and is destined to roll up the exposed film as it is unrolled when photographing. In the inside of this slide is a roller with two hooks, on to

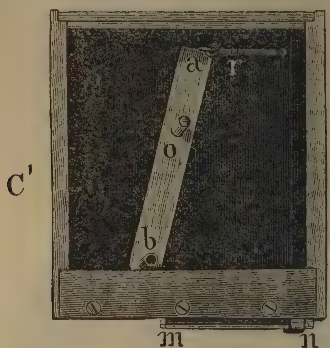


FIG. 5.

which the two foremost holes on the film are hooked. This receiving slide is fixed to the aforesaid bridging on the camera. The film-roller is used for rolling the film by hand. The film is introduced into a slit on the roller subsequently rolled, and thus about fifty to sixty feet of film are rolled in a few seconds.

For the purpose of making the positives a dark slide, P P (fig. 3), is used. This dark slide has two axles. On the lower axle the negative, N, is placed emulsion side outwards, and around the upper side the sensitive film, P, emulsion side inwards. The two ends are passed through the slit in the box. Subsequently proceed to expose the same as for negatives, only with this difference, that the positive film alone is introduced into the receiving slide, whereas the negative film will unroll outside through an opening arranged at the base of the apparatus.

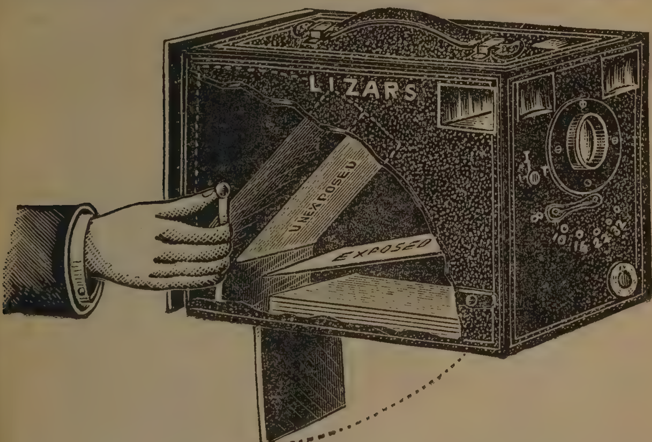
The shutter must be arranged so as to form a *complete semi circle.*

To make the exposure, close the apparatus, unscrew and remove the lens, and place before the circular opening, at a convenient distance, a light, either a gas flame or petroleum lamp. The distance which this light must be placed depends on the nature of its intensity, and the density and transparency of the negative. No precise instructions can therefore be given, but a few small strips exposed will give the necessary information to the operator. The light having been conveniently placed, all that remains is to turn the handle, the negative will fall into the basket provided under the tripod, whilst the positive will be rolled into the receiving box.

THE 'CHALLENGE' FILM MAGAZINE HAND CAMERA.

J. Lizars, 101, Buchanan-street, Glasgow.

THIS camera, which secured Mr. Lizars a medal at the recent Glasgow Exhibition, takes 50 cut films or a suitable number of plates, the use of sheaths being dispensed with. The notching of the films is also unnecessary, and, in use, the films and plates may be mixed if desired. At the back of each plate

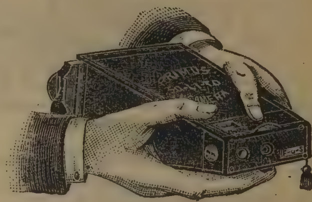


or film is placed a thin sheet of ferrotype, and, when the changing lever is pushed forward, the plate or film and the backing piece drop into the reservoir, and, by an ingenious arrangement of the changing mechanism, only one film and backing piece can be released. The changing system appears to be as certain as it is ingenious. The camera is a well-made instrument with ever set shutter working at various speeds, as well as time, brilliant finders, and exposure indicator.

THE PRIMUS 'SO-LI-TO' CAMERA.

W. Butcher & Son, Blackheath, S.E.

THIS is essentially a cyclists' and tourists' camera. A quarter-plate weighs two pounds, and it is of the field-glass pattern with mahogany body. It is covered in leather, the fittings are oxidised, and it carries a single lens with rotating stops. A time and instantaneous shutter with adjustable speeds.

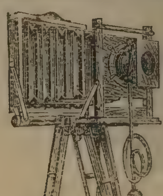


Edwards's metal double dark slides, and a ground-glass view-finder are among its other features. The manner in which it is employed may be gathered from the following instructions :—Remove the dark slides from inside the body of camera, place the dark slide in position, and press the sides of the camera (which fold down) up into position, set the shutter by means of the cord, remove the shutter of dark slide, and when the picture is seen on the view-finder release the shutter.

THE PREMIER OUTFIT.

L. Gandolfi, 752, Old Kent-road, S.E.

MR. GANDOLFI has submitted to us for inspection his half-plate premier outfit, consisting of an 8½ inch rectilinear lens ; camera ; and double dark slide ; and has shown us some excellent photographs taken with the apparatus by Mr. T. C. Sole, of Balfour, Cape Colony. The camera, which is well made of the best seasoned mahogany, has double swing back, reversing frame, rising



and falling front, double extending base with rack and pinion. A half-plate weighs 2½ lbs., and, when closed up, is only 2⅛ of an inch deep. It extends to 15 inches, and will allow of the use of a lens of 3½ inches focus. The lens is fixed on a revolving board. The camera as well as the book-form slide is extremely well made and finished, and the three-fold stand, which completes the set, is light, rigid, and strong.

HENLEY ROYAL REGATTA, 1897.

Taken with Smedley's "Up to Date" Camera and R. R. lens. Cheapest and best.

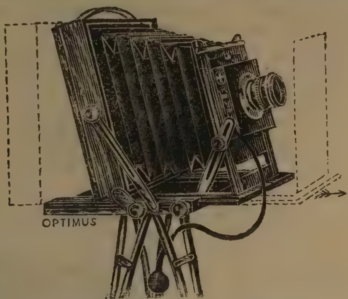
Collotype, Morgan & Kidd, Richmond.

By W. MARSHALL, Photographer, Henley-on-Thames.

OPTIMUS UNIVERSAL PHOTOGRAPHIC OUTFIT.

Perken, Son, & Rayment, 99, Hatton-garden, London.

THOSE who desire an inexpensive yet efficient set of photographic apparatus may advantageously inspect one very recently put upon the market by the Optimus people. The camera is very light, and, as the diagram shows, possesses all the necessary movements demanded by the modern photographer.



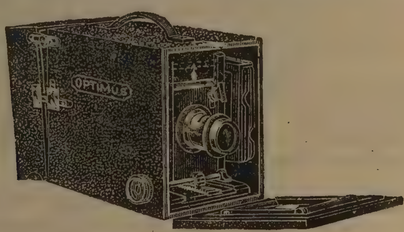
The lens is an Optimus rapid rectilinear ; a roller-blind shutter is attached to it. The tripod is compact, and forms a strong and rigid support.

Messrs. Perken, Son, & Rayment further inform us that the Rayment cameras have been very considerably reduced in price this year, but that the various improvements and the high-class workmanship are maintained.

'OPTIMUS' UBIQUE HAND CAMERA.

Perken, Son, & Rayment, 99, Hatton-garden, London.

SINCE our last reference to this little nstrument, two important improvements have been added to it, viz., an arrangement for swinging the back, in either the horizontal or vertical position, and a rising and falling front. This hand camera includes rack-and-pinion adjustment (actuated from outside), and a



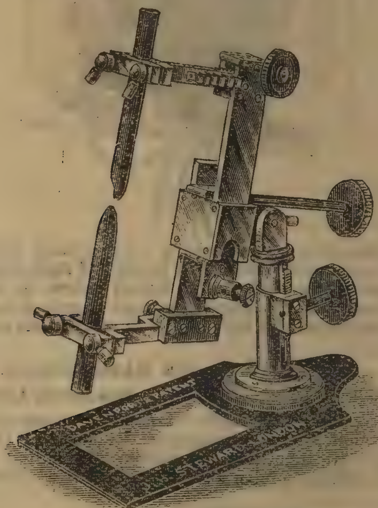
ground-glass screen for exact focussing, an Optimus rapid lens attached to a roller-blind shutter, and three double dark slides. As all are enclosed within the camera, it is self-contained. Two threaded nuts are fitted which receive screws for attachment to a tripod top. The camera being so small, it may be conveniently held in the hand for snap-shots. The external dimensions are $4\frac{1}{2} \times 5\frac{1}{2} \times 9\frac{1}{4}$.

THE DAVENPORT-STEWARD ARC LAMP.

J. H. Steward, 406, Strand, W.C.

In designing the 'Universal Arc Lamp,' the object in view has been to supply a regulator which, whilst specially adapted for ordinary lantern and cinematograph projections, should, at the same time, be provided with every form of adjustment necessary for the most delicate scientific work, such movements being placed so as to be readily accessible to the operator without requiring the lamp to be disturbed or removed from the lantern.

The above-named lamp may be used on either direct or alternating circuits



and with large or small currents giving from 500 to 5000 candle power as desired.

It is strongly made and well finished, and being constructed almost entirely of metal, will stand rough usage and great heat without risk or injury.

It is very compact, when fully extended, with carbons for two hours burning, being only 10 in. high, and the centre of illumination may be varied from 3 in. to 6 in. or more as desired.

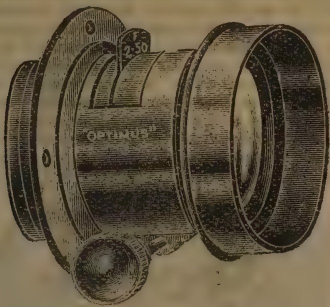
OPTIMUS OBJECTIVE FOR LANTERN PROJECTION.

Perken, Son, & Rayment, 99, Hatton-garden, London.

Messrs. Perken, Son, & Rayment, of Hatton Garden, London, are introducing a form of lens (styled the Optimus C series), which is particularly suitable for optical projection, the aperture being very large in relation to the focus; thus the No. 2 C has a diameter of 2⅝ inches, whilst the equivalent focus is 6½ inches; the No. 3 C has a diameter of 3½ inches, the focus being 8½ inches. The amount of light these lenses transmit gives a

very brilliant image on the screen, which is greatly enhanced by the crisp definition resulting from the precision of the curves of the lenses.

As these instruments possess absolute coincidence of the chemical and

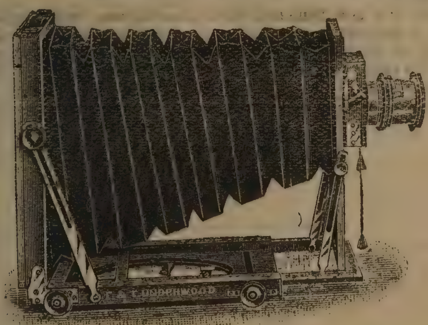


visual foci, diaphragms are supplied with them so that they may be advantageously employed for enlarging and copying, as well as for extremely rapid exposures in portraiture.

THE 'UMBRA' CAMERA.

E. & T. Underwood, 130, Granville-street, Birmingham.

The Umbra is a new camera specially designed for the requirements of pictorial photography. In addition to all usual movements, it has a contained turn-table, through which the shutter (a behind-lens one) folds when the camera is closed. The ordinary rack-and-pinion is duplicated, the second pinion being very useful with short-focus lenses, rendering unnecessary the shifting of the

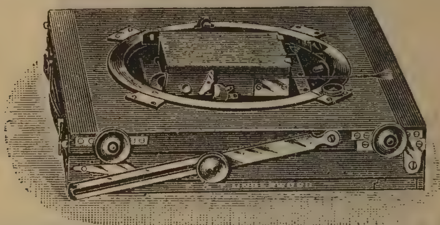


camera back. The shutter is a simple one of the roller-blind type, and is operated by the hand. By it an extra exposure to the foreground to any desired extent may be given. An equal illumination and an instantaneous exposure may also be made, at will. The front of the shutter is a detachable panel, so that various lenses may be used with it.

THE 'SALON.'

E. & T. Underwood, 130, Granville-street, Birmingham.

This camera has many special features of utility and convenience, the principal aim being to simplify in use the various necessary movements of the camera. The baseboard extension is by rack-and-pinion, two pinions being employed instead of the usual one. This enables the camera to be extended from the shortest to the largest possible range by racking alone without having to move either back or front of camera. The back has vertical swing, lateral swing, (very rarely used), and reversing back for placing the picture upright or horizontal as desired. This reversing back snaps into place with a spring action, which is out of sight and has no external catches or projections. The camera front is placed in position by holding it slanting backward and pressing the projections into the sockets in the baseboard. On bringing it into the



upright and tightening the side knobs it is perfectly firm and rigid. The rising front is of unusual range, and is kept in position by a novel and improved device. It is pushed up as required and stops there without any further trouble. The camera is kept closed by an improved arrangement which is entirely flush with the wood. It is operated by giving tho baseboard pinion a portion of a turn.

The shutter is a new time and instantaneous one, working behind the lens. The lens is a first-class rectilinear having a set of supplementary lenses. These are each in separate cells, and fit in a slot in the diaphragm plane of the lens mount, the result being an alteration in the focus of the combination, an engraved scale being provided for each. This is a notable feature of the apparatus and will be found extremely useful in landscape work,

FORMULÆ.

With the view of enabling the readers of the Almanac to find, more readily than hitherto, any particular one of the following numerous Formulæ or Tables, we give below an Index to the Contents of this section of the Almanac, which will doubtless facilitate reference.

DEVELOPING FORMULÆ FOR GELATINE DRY PLATES, ETC.

THE following are a few of the typical formulæ that are generally employed for development, &c.; a much greater variety will be found in the section headed 'Developing Formulæ of the Principal Plate-makers' (p, 903), to which we also refer the reader.

PYRO SODA.

No. 1.	A.	Sulphite of soda	6 ounces.
		Water	32 ,,
		Pyrogallic acid	1 ounce.

(Having dissolved the sulphite of soda, add sufficient citric acid in solution to cause a piece of blue litmus paper inserted therein to become reddened.)

	B.	Carbonate of soda	3 ounces.
		Carbonate of potash	1 ounce.
		Water	32 ounces.

When about to develop, mix these in equal proportions with two parts the bulk of water, or, if the weather be *very* hot at the time, even a greater proportion of water.

No. 2.	A.	Sulphite of soda (crystals)	2 ounces.
		Citric acid	60 grains.
		Ammonium bromide	40 ,,
		Pyro	1 ounce.
		Water	12 ounces.
	B.	Sulphite of soda (crystals)	2 ounces.
		Carbonate potassium (crystals)	3 ,,
		Water	12 ,,

To develop, use 1 drachm of each to 2 ounces of water.

PYRO AND AMMONIA.

No. 1.	Strong liquid ammonia	2 ounces.
	Bromide potassium	300 grains.
	Water	80 ounces.
No. 2.	Pyrogallic Acid	20 grains.
	Water	10 ounces.
	Nitric acid	2 drops.

For use take equal parts.

FERROUS OXALATE.

No. 1.	Saturated solution of sulphate of iron	1 part.
	Saturated solution of oxalate of potash	3 parts.

Mix *quant. suff.* by pouring the iron into the oxalate. In hot weather the proportion of the iron solution may be diminished with advantage.

For Transparencies on Gelatino-Chloride Plates.

No. 2.	A.	Neutral oxalate of potash	2 ounces.
		Chloride of ammonium	40 grains.
		Distilled water	20 ounces.
	B.	Sulphate of iron	4 drachms.
		Citric acid	2 ,,
		Alum	2 ,,
		Distilled water	16 ounces.

For black tones mix the above in equal volumes.

METOL.

Single-solution Developer.

Metol	40 grains.
Sulphite of soda	120 ,,
Hydroquinone	48 ,,
Carbonate of potash	240 ,,
Water	8 ounces.

Apply heat if necessary to dissolve the metol, and afterwards add the sulphite, and allow that to dissolve before adding the other ingredients.

For use under normal conditions, one part of the above is to be diluted with three parts of water.

Two-solution Developer.

A.	Metol	40 grains.
	Hydroquinone	48 ,,
	Sulphite of soda	120 ,,
	Water	8 ounces.
B.	Carbonate of potash	1 ounce.
	Water	1 quart.

For use, mix one part of A with three parts of B for ordinary exposures; for over-exposures use less of B, or else add a few drops of a ten per cent. solution of bromide of potassium, or of a five per cent. solution of citric acid; for slight under-exposure, increase B.

Three-solution Developer.

A.	Metol	40 grains.
	Sulphite of soda	120 ,,
	Water	8 ounces.
B.	Hydroquinone	40 grains.
	Citric acid	10 ,,
	Water	8 ounces.
C.	Carbonate of potash	1 ounce.
	Water	20 ounces.

For use under similar conditions to those already mentioned, take one part each of A and B and two parts of C.

METOL-HAUFF.

Solution A.

Water	100 parts.
Metol	1 part.
Soda sulphite	10 parts.

Solution B.

Water	100 parts.
Carbonate potash (or substitute)	10 ,,
Crystallised carbonate soda	20 ,,

For use, three parts A to one of B, with 40 minims of bromide of potassium solution (1 : 10).

METOL-ANDRESEN.

Water	1	quart.
Metol	¾	ounce.
Sulphite of soda	7	ounces.
Carbonate of potash	3½	,,
Bromide of potassium	$\frac{1}{10}$	ounce.

To photographers who prefer to work with separate solutions the following is recommended:—

A.	Water	1	quart.
	Metol	¾	ounce.
	Sulphite of soda	7	ounces.
B.	Water	3	quarts.
	Carbonate of soda	7	ounces.

Of these one part of A is mixed with three parts of water for use, bromide of potassium being added as required for the prevention of fogging.

ANDRESEN'S GLYCIN.

I. For soft development:

Solution A (warm slightly).

Glycin	4	parts.
Carbonate of potash	1½	,,
Sulphite of soda (cryst.)	12	,,
Water	100	,,

Solution B.

Carbonate of potash	10	,,
Water	100	,,

For use mix one part of *A* with two parts of *B*.

II. For hard development:

Glycin	5	parts.
Carbonate of potash	25	,,
Sulphite of soda (cryst.)	25	,,
Water	100	,,

For use to be diluted three times its volume.

GLYCIN-HAUFF.

The concentrated developer is made up as follows:—350 grains of sodium sulphite crystal are dissolved in one ounce of water, 150 grains of glycin are then added and heated to boiling point, and one and a half ounces of potash carbonate are added (begin adding the potash in small quantities, on account of the carbonic acid gas). When cold, this concentrated developer—forming a thin, pasty solution—may be kept as stock. For use, shake the solution first, and dilute the required quantity twelve times for ordinary purposes. For use when development is to be left to itself the stock solution is diluted fifty times.

A One-solution Formula.

Sodium sulphite	40 grains.
Glycin	20 ,,
Potassium carbonate	80 ,,
Water	4 ounces.

PARA-AMIDOPHENOL.

Para-amidophenol chlorhydrate	5 grammes.
Crystallised carbonate of sodium	50 ,,
Crystallised sulphite of sodium	50 ,,
Water	1000 ,,

For use, dilute with an equal bulk of water.

Para-amidophenol hydrochlorate	60 grains.
Sodium sulphite	60 ,,
,, carbonate	400 ,,
Water	20 ounces.

Dr. Andresen's Formula.

Para-amidophenol chlorhydrate	8 parts.
Sodium sulphite	80 ,,
,, carbonate	40 ,,
Water	1000 ,,

AMIDOL.

Amidol	80 grains.
Sodium sulphite	800 ,,
Water	8 ounces.

For use, one ounce of the solution is diluted with three ounces of water, with one and a half grains of potassium bromide to the ounce of developer.

EIKONOGEN.

No. 1.	A.	Crystalline sulphite of soda	40 grammes.
		Eikonogen	8 ,,
		Distilled water	500 c.cm.
	B.	Carbonate of potash (or calcined soda)	60 to 75 grammes.
		Distilled water	500 c.cm.

For use, mix equal volumes of A and B.

One-Solution Developer.

Sulphite of soda in crystals	8 ounces.
Carbonate of soda in crystals	3 ,,
Distilled water	80 ,,
Eikonogen	1 ounce.

HYDROQUINONE.

No. 1.		Hydroquinone	1 part.
		Sulphite of soda	2 parts.
		Carbonate of soda	10 ,,
		Water	67 ,,
No. 2.	A.	Hydroquinone	4 grains.
		Metabisulphite of potash	4 ,,
		Bromide of potassium	1 grain.
		Distilled water	1 ounce.
	B.	Potassium hydrate	10 grains.
		Distilled water	1 ounce.

Equal parts of A and B.

With some plates the bromide may be omitted.

No. 3.	A.	Hydroquinone	80 grains.
		Citric acid	10 ,,
		Sulphite of soda (recrystallised)	80 ,,
		Distilled water	20 ounces.
	B.	Caustic potash (fused)	160 grains.
		Sulphite of soda	160 ,,
		Distilled water	20 ounces.

	C.	Bromide of potassium	24 grains.
		Distilled water	1 ounce.
	D.	Caustic potash	160 grains.
		Distilled water	20 ounces.

For normal exposures use equal parts of A and B, adding five minims of C for every ounce of solution.

For over-exposed plates use D instead of B, with an extra quantity of C.

For under-exposed plates omit C, and in extreme cases add six or eight grains more of sulphite of soda to each ounce of the developer. The object of increasing or decreasing the quantity of sulphite is to give greater or lesser density.

No. 4.	A.	Hydroquinone	160 grains.
		Sulphite of soda	2 ounces.
		Citric acid	60 grains.
		Bromide of ammonium	20 ,,
		Water to	20 ounces.
	B.	Carbonate of potash	2 ounces.
		Carbonate of soda (crystal)	2 ,,
		Water to	20 ,,

Take equal parts.

No. 5.	A.	Hydroquinone	15 grains.
		Sulphite of soda	75 ,,
		Water	5 ounces.
	B.	Carbonate of potash	90 grains.
		Water	5 ounces.

C. Ten per cent. solution of bromide of potassium.

Use equal parts of A and B, and add two or three minims of C. With some plates no bromide restrainer will be required.

No. 6.	Sulphite of soda	40 grammes.
	Hydroquinone	5 ,,
	Carbonate of soda	75 ,,
	Water	200 c.c.

For use, dilute ten c.c. with water to thirty-five c.c.

For a single stock solution prepare as follows:—

No. 7.	A.	Hydroquinone	50 grains.
		Metabisulphite of potash	80 ,,
		Water	4 ounces.

B.	Carbonate of potash	840 grains.
	Water	4 ounces.

Filter solution B, and then mix A and B.

For use, take half an ounce of this solution and add to five ounces of water.

For Chloride Plates.

Hydroquinone	2 grains.
Sulphite of soda	10 ,,
Carbonate of ammonia (or pot.)	10 ,,
Bromide of potassium	$\frac{1}{10}$ grain.
Water	1 ounce.

DEVELOPING FORMULÆ, ETC., OF THE PRINCIPAL PLATE-MAKERS.

AUSTIN EDWARDS'S FORMULÆ.

Pyro.

No. 1.	Pyrogallic acid	1 ounce.
	Nitric acid	20 drops.
	Water	80 ounces.
No. 2.	Sulphite of soda	10 ounces.
	Carbonate of soda (crystals)	9 ,,
	Water	80 ,,

Add the acid to the water before dissolving the pyro.

For correct exposure, use equal parts of Nos. 1 and 2.
For under-exposure, use more No. 2.
For over-exposure use more No. 1, or add a few drops of per ounce 10 per cent. bromide potassium solution.
For correct exposure, no bromide is necessary.

Hydroquinone.

No. 1.	Water	20 ounces.
	Hydroquinone	120 grains.
	Sulphite soda	2 ounces.
No. 2.	Water	20 ounces.
	Carbonate of potash	4 ,,
	Bromide potassium	30 grains.

Dissolve the hydroquinone in the water before adding the sulphite. For use take equal parts of each.

Hydroquinone Developer for Lantern Plates.

(For Black Tones.)

Distilled water	20 ounces.
Hydroquinone	60 grains.
Sulphite soda	2 ounces.
Carbonate soda (crystals)	6 ,,
Bromide potassium	40 grains.

Dissolve the hydroquinone in the water and add the other ingredients in the order named.

Time of development, if exposed correctly, about 2 minutes. This developer may be used several times.

Pyro Developer.

(For Warm Tones.)

No. 1.	Water	20 ounces.
	Nitric acid	20 drops.
	Sulphite soda	4 ounces.
	Pyrogallic acid	1 ounce.
No. 2.	Water	20 ounces.
	Bromide ammonium (not potassium)	3 ,,
	Liq. ammonia ·880	1 ounce.

Add the acid to the water, and the other ingredients in the order named.

For use, take 1 part each of Nos. 1 and 2, and dilute with equal quantities of water. For still warmer tones, add 1 part more water, or again double the exposure and add one-fourth more No. 2. This developer may be used several times.

CADETT & NEALL'S FORMULÆ.

Pyro Ammonia (1).

Stock Solution.

Pyrogallic acid	(avoirdupois)	1	ounce.
Ammonium bromide	,,	½	,,
Potass. metabisulphite	,,	1	,,

Distilled water to make altogether, 7 ounces, 3 drachms, fluid.

Dissolve the metabisulphite and bromide in part of the distilled water before adding the pyrogallic acid.

A. Stock solution .... 1 ounce.
Distilled water to make altogether ...... 20 ounces = 1 pint.

B. Ammonia (·890) .... 2½ drachms.
Distilled water to make altogether ...... 20 ounces = 1 pint.

Mix equal parts of A and B to make developer.

Pyro-Ammonia (2).

Stock Solution.

Pyrogallic acid	(avoirdupois)	1	ounce.
Ammonium bromide	,,	1	,,
Sulphurous or sulphuric or citric acid		1	drachm.

Distilled water to make altogether, 7 ounces, 3 drachms, fluid.

Mix the acid with part of the distilled water before adding the bromide and pyrogallic acid.

A. Stock solution .... 1 ounce.
Distilled water to make altogether ...... 20 ounces = 1 pint.

B. Liq. ammoniæ (·890) .... 2½ drachms.
Distilled water to make altogether ...... 20 ounces = 1 pint.

Mix equal parts of A and B to make developer.

Ferrous Oxalate.

A. Ferrous sulphate .... (avoirdupois) 5 ounces.
Sulphuric acid .... 10 minims.
Distilled water to make altogether (avoirdupois) 20 ounces.

B. Neutral potass. oxalate .... (avoirdupois) 10 ounces.
Distilled water to make altogether .... (fluid) 40 ,,

Dissolve the potass. oxalate in about three-quarters of the distilled water, made warm, and make up to bulk after the salt is dissolved.

The ferrous sulphate should be powdered just before solution in about three-quarters of the distilled water to which the sulphuric acid has been previously added. Make up to bulk after solution.

To make developer, add one part of A to four of B. For over-exposure, add a few drops to the mixed developer of a ten per cent. solution of potassium bromide.

Pyro Soda.

Stock Solution.

	Pyrogallic acid	(avoirdupois)	1 ounce.
	{ Potassium metabisulphite		40 grains.
	{ or sulphuric acid	(fluid)	1 drachm.
	Distilled water to make altogether	,,	10 ounces.
A.	Stock solution....................................	(fluid)	3 ounces.
	Distilled water to make altogether	,,	20 ,,
B.	{ Sodium carbonate (crystals) ...	(avoirdupois)	11 ounces.
	{ or ditto ditto (anhydrous).........	,,	4 ,,
	Sodium sulphite (recrystd.)	,,	15 ,,
	Distilled water to make altogether	,,	80 ,,

Equal parts of each to make developer.

A few drops of a ten per cent. solution of potassium bromide may be added to the developer when necessary. In very hot weather the hypo bath should not be stronger than 1lb. of sodium hyposulphite to 2 quarts of water.

Developers for the 'Cadett' Lantern Plates.

Warm Tones.—Pyro Ammonia.

A.	Pyrogallic acid		40 grains.
	Ammonium bromide		40 ,,
	Potass metabisulphite		120 ,,
	Distilled water to make altogether.........	(fluid)	20 ounces.
B.	Liq. ammoniæ		150 minims.
	Distilled water to make altogether.........	(fluid)	20 ounces.

Equal parts of A and B to make developer.

This formula gives rich warm tones with suitable exposure.

For warm black tones, the following may be used :—

A. Pyrogallic acid	30	grains.
Sodium sulphite	100	,,
Sulphurous acid (or citric acid 5 grains)	5	minims.
Ammonium bromide	30	grains.
Distilled water to make altogether	20	ounces.
B. Liq. ammoniæ ·890	40	minims.
Distilled water to make altogether (fluid)	20	ounces.

Equal parts A and B to make developer.

A rich warm black can be obtained with hydroquinone, and we strongly recommend the following formula :—

A. Hydroquinone	70	grains.
{ Potass metabisulphite	10	,,
{ or sulphurous acid	15	minims.
Potassium bromide	35	grains.
Distilled water to make altogether (fluid)	20	ounces.
B. Potassium hydrate (sticks)	140	grains.
Sodium sulphite	700	,,
Distilled water to make altogether	20	ounces.

Equal parts A and B to make developer.

Black Tones.

Cold, but brilliant black tones are obtained with ferrous oxalate, adding a sufficient quantity of a 10 per cent. solution of potassium bromide to prevent too rapid development.

A. Ferrous sulphate (avoirdupois)	5	ounces.
Sulphuric acid	10	minims.
Distilled water to make altogether (avoirdupois)	20	ounces.
B. Neutral potass oxalate (avoirdupois)	10	ounces.
Distilled water to make altogether (fluid)	40	,,

Dissolve the potass oxalate in about ¾ of the distilled water, made warm, and make up to bulk after the salt is dissolved.

The ferrous sulphate should be powdered just before solution in about ¾ of the distilled water to which the sulphuric acid has been previously added. Make up to bulk after solution.

To make developer, add 1 part of A to 4 of B. For over-exposure add a few drops to the mixed developer of a 10 per cent. solution of potassium bromide.

EASTMAN COMPANY'S FORMULÆ.

For Bromide Paper.

No. 1.	Oxalate of potash	16	ounces.
	Hot water	48	,,
No. 2.	Proto-sulphate of iron	16	ounces.
	Hot water	32	,,
	Acetic acid (or citric acid, ½ ounce)	½	drachm.
No. 3.	Bromide of potassium	1	drachm.
	Water	10	ounces.

These solutions must be cooled and kept separately, and should be mixed only for immediate use.

To develop, take in a suitable tray, No. 1, six ounces; No. 2, one ounce; No. 3, half drachm. Mix in the order given; use cold. After exposure, soak the paper in water until limp; then immerse in the developer. The image should appear slowly, and should develop up strong, clear, and brilliant. When the shadows are sufficiently black, pour off the developer and flood the plate with the

Clearing Solution.

Acetic acid	1	drachm.
Water	32	ounces.

After fixing, wash thoroughly two hours, and hang up to dry. Use fresh developer for each batch of prints. With a glass-bottomed tray eight ounces of developer are sufficient for a 25 × 30 print.

For Kodak Films.

No. 1.	Sulphite of soda	6	ounces.
	Hot water	32	,,
	When cold, add—		
	Pyrogallic acid	1	ounce.

No. 2.	Carbonate of soda	3 ounces.
	Carbonate of potash	1 ounce.
	Water	32 ounces.

To develop, take, for normal exposures, one part each of No. 1 and No. 2, together with two parts of water.

Restrainer.

Bromide of potassium	1 ounce.
Water	6 ounces.

If a number of films are fixed together in one tray, they should be put in *face down*, to avoid abrasion of the sensitive surface. It is well to move them about in the fixing bath, from time to time, in order to remove any air bubbles. After fixing, *wash thoroughly;* then immerse for one minute in the

Soaking Solution.

Water	16 ounces.
Glycerine	½ ounce.

Remove from the soaking solution, and pin up each film by *one* of its corners, to dry spontaneously. Any tear drops of the soaking solution should be removed with a bit of blotting-paper or absorbent cotton.

EDWARDS'S FORMULÆ.

Pyro and Ammonia Developer.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.
	Citric acid	40 grains or 3 ,,
	Water	7½ ounces or 214 c. c.
No. 2.	Strong ammonia ·880	1 ounce or 28 c. c.
	Bromide of potassium	120 grains or 8 grammes.
	Distilled water	7 ounces or 200 c. c.

The above will keep good for months, if well corked.

For use, dilute 1 part No. 1 with 19 parts of water, and in another

bottle 1 part No. 2 with 19 parts of water. The dilute solutions should be made fresh every day.

To develop a correctly exposed plate or film mix equal parts of these two solutions.

Pyro and Soda Developer.

No. 1.	Pyrogallic acid......................	1 ounce or 30 grammes.
	Nitric acid	20 drops or 1 c. c.
	Water	80 ounces or 2 litres 300 c. c.
No. 2.	Sulphite of soda	10 ounces or 300 grammes.
	Carbonate of soda (washing soda)	8 ounces or 226 grammes.
	Water	80 ,, ,, 2 litres 300 c. c.
No. 3.	Bromide of potassium............	1 ounce or 30 grammes.
	Water	9 ounces or 250 c. c.

To develop, mix equal parts of Nos. 1 and 2, and add 10 minims of No. 3 to each ounce of the mixed developer, or, instead, 3 ounces of No. 3 may be added to the 80 ounces of No. 2. For rapid shutter exposures, omit the bromide.

Pyro and Soda Developer with Metabisulphite.

No. 1.	Pyrogallic acid......................	1 ounce or 30 grammes.
	Metabisulphite of soda (Boake's)	1 ,, ,, 30 ,,
	Water	80 ounces or 2 litres 300 c. c.

Dissolve the metabisulphite, and then add the pyro.

No. 2.	Carbonate of soda (washing soda)	12 ounces or 360 grammes.
	Sulphite of soda..................	4 ,, ,, 120 ,,
	Water	80 ,, ,, 2 litres 300 c. c.
No. 3.	Bromide of potassium	1 ounce or 30 grammes.
	Water	9 ounces or 250 c. c.

To develop, mix equal parts of Nos. 1 and 2. When working in the summer time in a good light, with full exposure, add 5 minims of No. 3 to each ounce of developer (or to save the trouble of measuring small quantities, 1½ ounces of No. 3 may be added to the 80 ounces of No. 2). In winter the bromide may generally be omitted, and also for rapid shutter exposures, and portrait work in the studio.

Hydroquinone Developer.

No. 1.	Hydroquinone	¼	ounce or 7 grammes.
	Sulphite of soda	1	,, ,, 30 ,,
	Bromide of potassium	7	grains or ½ gramme.
	Distilled boiling water to make	12	ounces or 340 c. c.
No. 2.	Carbonate of potash	½	ounce or 15 grammes.
	Distilled water to make	12	ounces or 340 c. c.

First dissolve the hydroquinone, and then add the sulphite and bromide.

For use mix equal parts of Nos. 1 and 2.

In case of slight over-exposure add a few drops or minims of a 10 per cent. solution of bromide of potassium to each ounce of developer, more or less according to the extent of over-exposure. For considerable over-exposure use the redeveloper.

For under-exposure, pour off the hydroquinone developer and finish development with the eikonogen developer given below.

Eikonogen Developer.

Eikonogen	½	ounce or 14 grammes.
Carbonate of potash	1	,, ,, 30 ,,
Sulphite of soda	2	ounces or 60 ,,
Distilled boiling water	20	,, ,, 600 c. c.

First dissolve the eikonogen, then the sulphite, and lastly the carbonate of potash.

Instead of mixing the developers, the development may be commenced with eikonogen, and when the detail is sufficiently out, hydroquinone substituted for it, without waiting to wash the negative, and the development finished with this, or in case of much over-exposure with the following hydroquinone redeveloper :—

Hydroquinone Redeveloper.

No. 1.	Hydroquinone	¼	ounce or 7 grammes.
	Sulphite of soda	2	ounces or 60 ,,
	Bromide of potassium	¼	ounce or 7 ,,
	Distilled boiling water to make	12	ounces or 340 c. c.

No. 2. Carbonate of soda (washing soda)	2 ounces or 60 grammes.	
Sulphite of soda	2 ,,	,, 60 ,,
Distilled water to make	12 ,,	,, 340 c. c.

For use mix equal parts of Nos. 1 and 2.

Edwards's Gelatino-chloride Plates.

Development.

Make two stock solutions as follows:—

No. 1.	Neutral oxalate of potash	2 ounces.
	Chloride of ammonium	40 grains.
	Distilled water	20 ounces.
No. 2.	Sulphate of iron	4 drachms.
	Citric acid	2 ,,
	Alum	2 ,,
	Distilled water	20 ounces.

The above solutions will keep indefinitely.

When required for use, mix equal portions of the above solutions, adding No. 2 to No. 1, to form the developer.

Edwards's Special Transparency Plates.

Pyro and Ammonia Developer.

For Warm Tones.

No. 1.	Pyrogallic acid	1 ounce or 30 grammes.	
	Sulphite of soda	4 ounces or 120	,,
	Citric acid	¼ ounce or 8	,,
	Water to make	16 ounces or 460 c. c.	

First dissolve the sulphite and citric acid, and then add the pyrogallic.

No. 2.	Bromide of ammonium	1 ounce or 30 grammes.
	Liq. ammoniæ ·880	5½ drachms or 20 c. c.
	Water to make	16 ounces or 460 c. c.

For use, mix 1 part of No. 1 and 3 parts of No. 2, and dilute with water to double the quantity.

Hydroquinone Developer.

For Black Tones.

Hydroquinone	60 grains or	3 grammes.
Sulphite of soda	2 ounces or	45 ,,
Carbonate of soda (crystals)	4 ,, ,,	90 ,,
Carbonate of potash	2 ,, ,,	45 ,,
Bromide of potassium	40 grains or	2 ,,
Hot distilled water	20 ounces or	450 c. c.

For black and white line subjects add 1 drachm of a 60-grain solution bromide of potassium to each ounce of developer.

Dissolve the hydroquinone in the water, and add the other ingredients in the order named.

Amidol Developer.

For Black Tones.

Amidol	80 grains or	5 grammes.
Soda sulphite	2 ounces or	60 ,,
Bromide of potassium	½ ounce or	15 ,,
Water	12 ounces or	360 c. c.

ELLIOTT & SONS' FORMULÆ.

THE 'BARNET' PLATES, ORDINARY.

No. 1.	Ammonia (·880)	1½ ounce.
	Water	20 ounces.
No. 2.	Pyrogallic acid	160 grains.
	Bromide of ammonium	¾ ounce.
	Water	20 ounces.
	Pure nitric acid	10 drops.

For use, mix ½ an ounce of No. 1, ½ an ounce of No, 2 with 3 ounces of water.

Pyro and Ammonia (ten per cent. Solutions).

No. 1.	Ammonia (·880)	1 ounce.
	Water	9 ounces.

No. 2.	Bromide of ammonium	1 ounce.
	Water, to make	10 ounces.
No. 3.	Pyro	1 ounce.
	Water, to make	10 ounces.
	Nitric acid, pure	20 drops.

For studio use, take 80 minims No. 1, 40 minims No. 2, 20 minims No. 3, and make up to 2 ounces with water.

The above developer is the same strength as that recommended on the boxes.

For outdoor work, take 80 minims No. 1, 60 minims No. 2, 40 minims No. 3, and make up to 2 ounces with water.

Pyro and Soda Developer.

Solution No. 1.

Pyro	1 ounce.
Water	86 ounces.
Nitric acid, pure	20 drops.

Solution No. 2.

Pure sulphite soda	10 ounces.
Pure carbonate soda (crystals)	9 ,,
Water	86 ,,

Use equal parts of No. 1 and 2, and dilute with equal bulk of water. To each ounce add 1 or 2 drops of a ten per cent. solution of bromide of potassium.

'Barnet' Lantern Transparency Plates.

For Cold or Warm Tones (according to exposure and development).

Instructions for Use.

Contact Printing.—For black tones the exposure required is about 10 seconds at a distance of 1 foot from an ordinary gas flame: the developer to be used is either No. 1 or 2.

To secure warm tones it is necessary to increase the exposure to 2 or 3 minutes and use formula either No. 3 or 4.

To obtain still warmer (reddish) tones, increase the exposure still further to 5 or 6 minutes and develop with formula No 5.

Reductions in the Camera.—For black tones with stop *f*-16 in bright

diffused light from a half-plate negative an exposure of about 10 seconds is required, using formula No 1 or 2 for developing.

For warm tones increase the exposure to 2 or 3 minutes and using for developer either formula No. 3 or 4.

For still warmer tones further increase the exposure to 5 or 6 minutes and develop with formula No. 5.

Formulæ for Developers.

Note.—In cold weather all solutions should be raised to a temperature of 60°.

Cold Black Tones.

A.

No. 1.	Metol	400	grains.
	Soda sulphite	8	ounces.
	Water	80	,,

B.

Carbonate of potash	1200	grains.
Ammonium bromide	240	,,
Potassium bromide	480	,,
Water	80	ounces.

Take equal parts of A and B.

Note.—The ammonium bromide is necessary for the production of absolutely cold black tones; a larger quantity is not recommended, as it tends to produce a slight veil in the high lights.

Length of time in developing about 2 minutes.

Warm Black Tones.

A.

No. 2.	Hydroquinone	640	grains.
	Soda sulphite	8	ounces.
	Potass bromide	120	grains.
	Water	80	ounces.

B.

Sodium hydrate	640 grains.
Water	80 ounces.

Take equal parts of A and B.

This produces a very pleasing warm black. Length of time in developing about 2 minutes.

Warm Brown Tones.

A.

No. 3.	Pyro	1 ounce.
	Soda sulphite	4 ounces.
	Water	80 ,,

B.

Carbonate of ammonia	900 grains.
Potassium hydrate	750 ,,
Ammonium bromide	600 ,,
Water	80 ounces.

Take equal parts of A and B.

Length of time in developing about 2 minutes.

Or the following may be used:—

No. 4.—Take equal parts of No. 2 formula and add to each ounce 3 grains carbonate of ammonia and 3 grains of ammonium bromide.

Length of time in developing about 3 or 4 minutes.

Very Warm (Reddish) Tones.

No. 5.—Take equal parts of No. 2 formula and add to each ounce 6 grains of carbonate of ammonia and 6 grains ammonium bromide.

Length of time in developing about 8 minutes.

Fixing Bath.

We recommend the bath not to be made stronger than

Hypo	5 ounces.
Water	20 ,,

Clearing solutions will not be found necessary with these plates.

BARNET BROMIDE PAPER.

(Extra Rapid)

Platino Matt Surface.—Directions for Working.

Exposure.—For contact work from an average negative about 4 seconds, 18 inches from an ordinary gas burner.

For enlarging it is impossible to give any fixed data, so much depending upon the source of light. It is recommended to make a trial exposure upon a small piece of paper.

After exposure place the print, sensitive side upwards, in a clean developing dish, flood with water for a few seconds, drain off water, and then with one sweep cause the developer to flow evenly and quickly over the whole surface of the print.

Developers.—Ferrous-oxalate.

A.	Oxalate of potash	1 pound.
	Bromide potass	5 grains.
	Hot water	48 ounces.
B.	Sulphate of iron	1 pound.
	Citric acid	½ ounce.
	Hot water	32 ounces.

Take 6 ounces of A and 1 ounce of B.

Immediately after developing, the print must be transferred straight into the acid bath.

Acetic acid	1 drachm.
Water	32 ounces.

We strongly recommend the following

Metol Developer.

A.	Metol	400 grains.
	Sodium sulphite	8 ounces.
	Potass bromide	50 grains.
	Water	80 ounces.
B.	Potass carbonate	8 ounces.
	Water	80 „

Take 3 ounces of A and 1 ounce of B.

The image should appear in a few seconds, and development will be complete in about 2 minutes. Rinse in 3 changes of water and fix in fixing bath as above (no acid bath is necessary with this developer).

To produce softer results, either of the above may be diluted with an equal quantity of water.

After fixing, wash thoroughly in several changes of water for at least 2 hours, squeegee off the superfluous moisture, and hang up to dry.

GEM DRY PLATE COMPANY'S FORMULÆ.

DEVELOPER FOR PLATES AND FILMS.

No. 1.	Pyrogallic acid	1 ounce.
	Potassium bromide	60 grains.
	Sulphite of soda	6 ounces.
	Water to	50 ,,
No. 2.	Washing soda	6 ounces.
	Water to	50 ,,

For use, take equal quantities of No. 1 and No. 2.
For known under-exposure use an increased proportion of No. 2.
For known over-exposure use larger quantity of No. 1.

Alum Bath.

Alum	1 ounce.
Water	20 ounces.

Wash before and after immersing in the alum bath.

Fixing Solution.

Hypo	1 pound.
Water	64 ounces.

LANTERN PLATES.

Developer for Cold or Warm Tones.

Cold Tones.

Hydroquinone.

A.	Hydroquinone	½ ounce.
	Citric acid	¼ "
	Potassium bromide	60 grains.
	Water	20 ounces.
B.	Caustic soda	½ ounce.
	Sodium sulphite	3 ounces.
	Water	20 "

For use, take equal parts of A and B, and dilute with water equal to their combined bulk.

Warm Tones.

C.	Ammonium carbonate	1 ounce.
	Ammonium bromide	1 "
	Water	20 ounces.

For use, take of the above hydroquinone formula 2 parts, and add 1 part of C.

In obtaining either cold or warm tones, it is well to remember that exposure is the greatest factor. For cold tones, an exposure of 10 to 20 seconds, 1 foot from a No. 5 gas burner, will be ample, and develop as above. For warm and deeply coloured tones, expose from 30 seconds to 3 minutes, and develop with addition of C, always using a slightly increased proportion of C as the exposure is prolonged.

THE ILFORD FORMULÆ.

STOCK SOLUTION OF PYRO.

Water	5½ ounces.
Nitric acid	20 minims.
Pyrogallic acid	1 ounce.

Add the acid to the water *before* the pyro, and the solution will then keep good for several months.

For Soft Negatives.

No. 1.	Stock solution	1 ounce.
	Water to make up to	20 ounces.

For Dense Negatives.

	Stock solution	2 ounces.
	Water to make up to	20 ,,
No. 2.	Carbonate of soda, crystals (not bicarbonate) (avoirdupois)	2 ounces.
	Sulphite of soda ,,	2 ,,
	Bromide of potassium	20 grains.
	Water to make up to	20 ounces.

For normal exposures take equal quantities of Nos. 1 and 2.

Alum Bath.—After developing, wash the plate well under the tap, and immerse for a few minutes in

Alum	8 ounces.
Water	20 ,,

Never omit the alum bath, and do not be tempted to add any other chemical either to that or to the fixing bath.

Ilford Bromide Paper and Opals.

Development.—Make the following solutions and use when cold :—

No. 1.	Neutral oxalate potash (avoirdupois)	1 pound.
	Warm water	64 ounces.
	Bromide ammonium	20 grains.
	Filter.	
No. 2.	Sulphate iron (avoirdupois)	1 pound.
	Warm water	48 ounces.
	Sulphuric acid	1 drachm.
	Filter.	

For use, add 1 ounce No. 2 to 6 ounces No. 1, not *vice versâ.* As for Alpha, old developer gives brilliancy, especially in cases of over-exposure or weak negatives. Development is complete when image appears fully out. After development and without washing, immerse the prints for about 2 minutes in clearing solution, pour off and repeat.

Clearing Solution.

Water	80 ounces.
Sulphuric acid	½ ounce.

Then wash thoroughly for about 10 minutes in several changes of wate., All the acid must be removed, or fading of prints will result.

After fixing, wash for 2 hours in running water or in frequent changes. Allow prints to dry naturally. Work with clean hands and clean dishes.

A Universal Developer.

No. 1.	Hydroquinone		160 grains.
	Bromide of potassium		30 ,,
	Sulphite of soda	(avoirdupois)	2 ounces.
	Water to		20 ,,
No. 2.	Soda hydrate		100 grains.
	Water		20 ounces.

Use as follows:—For negatives on Ilford plates: Equal parts Nos. 1 and 2.

For Ilford alpha lantern plates (for warm tone): One part No. 1; half part No. 2; two parts water.

For Ilford bromide papers: One part No. 1; one part No. 2; one part water.

For Ilford special lantern plates (for black tones): Equal parts Nos. 1 and 2.

Although it must be understood that, in our opinion, hydroquinone is somewhat inferior to ferrous oxalate for papers, yet we do not hesitate to put forward this universal developer as an alternative method of working for those who desire simplicity.

Note.—The clearing bath must not be used when developing with hydroquinone.

For Alpha Paper,

For producing Warm Toned Prints by Development.

Make the following solutions, and do not use until cold:—

No. 1.	Oxalate of potash (neutral)	(avoirdupois)	1 pound.
	Bromide of ammonium		320 grains.
	Warm water		64 ounces.
	Filter.		
No. 2.	Sulphate of iron	(avoirdupois)	4½ ounces.
	Citric acid	,,	½ ounce.
	Water	,,	80 ounces.
	Filter.		

For use, add one part of No. 2 to three parts of No. 1, not *vice versâ*.

THE IMPERIAL COMPANY'S FORMULÆ.

'IMPERIAL STANDARD' DEVELOPER.

No. 1.

Pyrogallic acid	55 grains.
Metol	45 ,,
Metabisulphite of potash	120 ,,
Bromide of potassium	20 ,,
Water (boiled or distilled) to	20 ounces.

No. 2.

Carbonate of soda (washing soda)	4 ounces.
Water (boiled or distilled) to	20 ,,

For use take equal parts of No. 1 and No. 2.

'IMPERIAL UNIVERSAL' DEVELOPER.

No. 1.

Metol	40 grains.
Hydroquinone	50 ,,
Sulphite of soda	120 ,,
Bromide of potassium	15 ,,
Water (boiled or distilled) to	20 ounces.

No. 2.

Caustic potash	180 grains.
Water (boiled or distilled) to	20 ounces.

For use take equal parts of No. 1 and No. 2.

'IMPERIAL PYRO-SODA' DEVELOPER.

Stock Solution.

Pyrogallic acid	1 ounce.
Bromide of potassium	50 grains.
Metabisulphite of potash	40 ,,
Water (boiled or distilled) to	9 ounces.

No. 1.

Stock solution	3 ounces.
Water (boiled or distilled)	20 ,,

No. 2.

Sulphite of soda	2 ounces.
Carbonate of soda	2 ,,
Water (boiled or distilled) to	20 ,,

For use take equal parts of No. 1 and No. 2.

'Imperial Metol' Developer.

No. 1.

Metol	100 grains.
Metabisulphite of potash	10 ,,
Bromide of potassium	20 ,,
Water (boiled or distilled) to	20 ounces.

No. 2.

Sulphite of soda	2 ounces.
Carbonate of soda	2 ,,
Water (boiled or distilled) to	20 ,,

For use take equal parts of No. 1 and No. 2.

'Imperial Hydroquinone' Developer.

No. 1.

Hydroquinone	150 grains.
Metabisulphite of potash	10 ,,
Bromide of potassium	50 ,,
Water (boiled or distilled) to	20 ounces.

No. 2.

Sulphite of soda	2 ounces.
Caustic soda	100 grains.
Water (boiled or distilled) to	20 ounces.

For use take equal parts of No. 1 and No. 2.

'Imperial Single-solution' Developer.

Metol	50 grains.
Hydroquinone	40 ,,
Sulphite of soda	500 ,,
Bromide of potassium	25 ,,
Carbonate of soda	500 ,,
Water (boiled or distilled) to	20 ounces.

Imperial 'Special' Lantern Plates.

For producing Transparencies of a Black Tone.

The exposure required for a negative of ordinary density will be about 5 seconds, at a distance of 24 inches from a medium sized gas burner.

Developing formula (hydroquinone) is the same as that used with our ordinary plates.

For development, use 1 part of No. 1 to 1 part of No. 2, and 1 part of water.

Metol developer is also excellent.

After development, the manipulations, washing, &c., will be the same as for negatives.

Imperial 'Slow' Lantern Plates.

For producing Transparencies of a Warm Tone.

The exposure required for a negative of ordinary density will be about 15 seconds, at a distance of 12 inches from a medium size gas burner.

Developing formula (hydroquinone) is the same as that used with 'special' lantern plates.

Imperial Bromide Opals.

Developers.

Metol. A.

No. 1.	Metol	50 grains.
	Dissolve in water	10 ounces
	Then add soda sulphite	1 ounce.
No. 2.	Soda carbonate (washing soda)	2 ounces.
	Water to	10
No. 3.	Potassium bromide	½ ounce.
	Water to	10 ounces.

The developer for normal exposures to consist of 3 parts of No. 1 to 1 part of No. 2, to each ounce of which may, as a rule, be added 20 minims of No. 3.

Oxalate and Iron. B.

No. 1.	Potash oxalate	4 ounces.
	Water	16 „
No. 2.	Iron sulphate	8 ounces.
	Water	12 „
	Citric acid	60 grains.

Add 1 ounce of No. 2 to 5 ounces of No. 1; and to every ounce of developer add about 10 drops of a ten per cent. solution of potassium bromide.

No. 2 solution must always be added to No. 1 and not *vice versâ.*

MARION'S FORMULÆ

For portraiture the following is recommended :—

PYRO STOCK SOLUTION.

Pyrogallic acid	1 ounce.
Sodium sulphite	4 ounces.
Sulphuric acid	1 drachm.
Water to make up	20 ounces.

SODA STOCK SOLUTION.

Sodium carbonate cryst.	8 ounces.
Sodium sulphite	4 ounces.
Potassium bromide	1 drachm.
Water to make up	20 ounces.

For Development.

Five ounces of each stock solution made up separately to 20 ounces with water and mixed in equal parts at the time of using. When very soft negatives are required—or only a minimum of exposure can be given—the bromide of potassium may be omitted.

PYRO-AMMONIA.

Pyrogallic acid	1 ounce.
Ammonium bromide	1 ,,
Citric acid	1 drachm.
Water to make up	10 ounces.

AMMONIA.

Strongest liquid ammonia ·880	2 ounces.
Water to make up	10 ,,

Two ounces of each of above separately made with water to 20 ounces, form the solutions for use. Equal parts being mixed together at the time of development.

HYDROQUINONE DEVELOPER.

Hydroquinone Solution.

Hydroquinone	40	grains.
Sodium sulphite, pure	120	,,
Potassium brom.	5	,,
Citric acid	5	,,

Water to make up to 10 ounces.

Alkali Solution.

Potass. hydrate, pure	120	grains.

Water to make up to 10 ounces.

This developer, mixed in equal proportions, will contain per ounce Hydroquinone, 2 grains; sulphite, 6 grains; brom., ¼ grain; citric, ¼ grain; hydrate, 4 grains.

FOR GELATINO-CHLORIDE PLATES.

IRON.

For Cold Tones.

No. 1.	Potass. citrate	100	grains.
	Potass. oxalate	30	,,

Hot distilled water to make up to 1 ounce.

For Warm Tones.

No. 2.	Citric acid	90	grains.
	Ammonium carbonate	60	,,

Cold distilled water to make up to 1 ounce.

For Extra Warm Tones.

No. 3.	Citric acid	130	grains.
	Ammonium carbonate	40	,,

Cold distilled water to make up to 1 ounce.

In mixing the solutions Nos. 2 and 3, it is better to place the crystals of the salts into a deep vessel, and, after adding the water, leave alone till all effervescence ceases. It is advisable to make it over night.

To three parts of either of the above add one part of the following at the time of using :—

Sulphate of iron	120 grains.
Sulphuric acid	1 drop.

Make up with distilled water to 1 ounce.

Either of these developers should give clear glass in the unexposed parts of the picture; but, if at any time the slightest fog is found, it should at once be cured by the addition of a trace of either potassium bromide or sodium chloride. Bromide is better with No. 1, and chloride with either No. 2 or No. 3. A convenient form of using these will be to keep a ten per cent. solution of each of these salts, and one or two minims to each ounce of developer will be found a powerful restrainer.

Hydroquinone.

No. 1.	Hydroquinone	48 grains.
	Sodium sulphite	320 ,,
	Ammonium bromide	2 ,,

Water to make up to 10 ounces.

No. 2.	Ammonium carbonate	100 grains.
	Sodium carbonate	100 ,,

Water to make up to 10 ounces.

Equal proportions of each are mixed together, according to size of plate to be developed at the time of using.

Different alkalies may be substituted for those mentioned, such as potassium carbonate, sodium silicate, potassium hydrate, sodium hydrate, &c.; but, in all cases, a small proportion of bromide should be used.

A number of plates may be developed one after the other in the same solution.

Eikonogen.

This developing agent, first introduced by us, will be found to give admirable results of a pleasing colour.

Formula.

Sulphite soda, pure	200 grains.
Eikonogen	50 ,,
Potassium bromide	5 ,,
Water to make up to	10 ounces.
Sodium carbonate	160 grains.
Water to make up to	10 ounces.

Equal parts to be mixed together at time of using.

FOR CHLORO-BROMIDE PLATES.

Pyrogallic Development.

A.	Pyrogallic acid	40 grains.
	Pure sodium sulphite	16 ,,
	Citric acid	5 ,,
	Water	10 ounces.
B.	Liq. am. fort.	40 minims.
	Potassium bromide	40 grains.
	Water to make up to	10 ounces.

Equal parts of the solutions to be mixed at the time of using.

A very pleasing warm colour will be obtained by adding to the B solution 200 grains of ammonium carbonate, but the time of development will be increased.

Ferrous-oxalate Development.

The saturated solutions of potassic oxalate and iron sulphate may be used in the proportion of three or four parts of the former to one of the latter, with the addition of one grain of potassium bromide to each ounce of developer, adding more bromide and increasing the amount of exposure when warmer tones are required.

To keep the iron solution from oxidising, one drop of sulphuric acid should be added to each ounce of water before dissolving the salt.

The ferrous-oxalate gives a blacker coloured image than pyrogallic developer.

The time of development will vary from two to four minutes, according to temperature and density of image required.

Hydroquinone Developer.

Hydroquinone Solution.

Hydroquinone	40 grains.
Sodium sulphite, pure	120 ,,
Potassium bromide	5 ,,
Citric acid	5 ,,
Water to make up to	10 ounces.

Alkali Solution.

Potassium hydrate, pure....................................	80 grains.
Water to make up to	10 ounces.

Equal parts to be mixed together at time of using.

It is advisable that all solutions should be made with distilled water, though not absolutely essential.

Several plates may be developed in the same solution.

EIKONOGEN DEVELOPER.

This developer will be found to suit these equally well with slight modification.

A small proportion of bromide must be used to ensure absolute clearness in the unexposed parts.

Formula.

Sodium sulphite	400 grains.
Potassium bromide	5 ,,
Eikonogen	100 ,,
Water to make up to	10 ounces.
Sodium carbonate	320 grains.
Water to make up to	10 ounces.

Equal parts of each to be mixed together at time of using.

FOR ARGENTIC BROMIDE OPALS.

Formula for Amidol Developers.

Amidol	20 grains.
Sodium sulphite	200 ,,
Potassium bromide	20 ,,

Made up to 10 ounces with water.

Form the developer in one solution ready for use. Plates developed with this formula will not require the acid bath previous to fixing.

Formula for Eikonogen Developer.

Eikonogen	40 grains.
Sodium sulphite	160 ,,
Lithium carbonate	2 ,,
Water to make up to	10 ounces.

This will keep for a considerable time if well corked.

One drop of a ten per cent. solution of potassium bromide may be added to each ounce of developer.

Plates developed with eikonogen will not require the acid bath previous to fixing.

MAWSON & SWAN'S FORMULÆ.

The 'Mawson' or 'Castle' Plate.

Developers.

Pyro-ammonia Developer.

Stock Solution (ten per cent.).

Pyrogallic acid	480 grains.
Bromide of ammonium	240 ,,
*Metabisulphite of potassium	480 ,,
Distilled water to make up....................(fluid)	10 ounces.

Dissolve the metabisulphite in part of the water, then add the other ingredients, and make up to bulk with water.

A.	Stock solution..	300 minims.
	Distilled water to make up to ....(fluid)	10 ounces.
B.	Liq. ammonia ·880..	70 minims.
	Distilled water to make up to ....(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Pyro-soda Developer.

Pyrogallic acid		60 grains.
*Metabisulphite of potassium		15 ,,
Distilled water to make up to	(fluid)	10 ounces.
B. Washing soda		600 grains.
Sulphite of soda		800 ,,
Distilled water to make up to	(fluid)	10 ounces

Use equal parts of A and B mixed at time of developing.

To correct errors in exposure :—If under-exposed, use a larger proportion of B ; if over-exposed, decrease the proportion of B, and add a few drops of a 10 per cent. solution of bromide of potassium.

* Metabisulphite of potassium is unequalled as a preservative of pyrogallic acid in solution. If not at hand, substitute for each grain of metabisulphite, sulphuric acid ½ minim *plus* sulphite of soda, 2½ grains.

Eikonogen Developer.

A. Eikonogen		100 grains.
Sulphite of soda (recrystd.)		100 ,,
Distilled water to make up to	(fluid)	10 ounces.
B. Carbonate of potassium (com.)		1200 grains.
Sulphite of soda (recrystd.)		500 ,,
Distilled water to make up to	(fluid)	10 ounces.

Use 3 parts of A to 1 part of B, mixed at time of devoloping.

Hydroquinone Developer.

A. Hydroquinone		40 grains.
Metabisulphite of potassium		40 ,,
Bromide of potassium		5 ,,
Distilled water to make up to	(fluid)	10 ounces.
B. Caustic potass (sticks)		80 grains.
Distilled water to make up to	(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

The 'Mawson' Photo-mechanical Plate.

Developers.

Pyro-ammonia Developer.

A.	Pyrogallic acid	30 grains.
	Bromide of ammonium	30 ,,
	Metabisulphite of potassium	30 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Liq. ammoniæ ·880	70 minims.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A	Hydroquinone	40 grains.
	Bromide of potassium	10 ,,
	Metabisulphite of potassium	40 ,,
	Distilled water to make up to (fluid)	10 ounces.
B.	Caustic potass (sticks)	80 grains.
	Distilled water to make up to (fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

The 'Mawson Lantern' Plate.

Developers.

Exposure.—A negative of average density requires about 15 seconds at 1 foot from a No. 6 batswing burner. Short exposure tends to produce black tones; long exposure, brown tones.

Either of the following developers may be used, though we give the preference to the pyro-ammonia, greater variety of tone being available by it.

Development begins rather slowly, especially with the hydroquinone formula, afterwards proceeding more rapidly.

Pyro-ammonia Developer.

A.	Pyrogallic acid	20 grains.
	Bromide of ammonia	20 ,,
	Metabisulphite of potassium	50 ,,
	Distilled water to make up to (fluid)	10 ounces.

B. Liq. ammoniæ ·880	......	70 minims.
Distilled water to make up to	......(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Hydroquinone Developer.

A. Hydroquinone	......	40 grains.
Bromide of potassium	......	40 ,,
Metabisulphite of potassium	......	40 ,,
Distilled water to make up to	......(fluid)	10 ounces.
B. Caustic potass (sticks)	......	80 grains.
Distilled water to make up to	......(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Eikonogen Developer.

A. Eikonogen	......	100 grains.
Bromide of potassium	......	20 ,,
Sulphite of sodium (recrystd.)	......	100 ,,
Distilled water to make up to	......(fluid)	10 ounces.
B. Washing soda	......	600 grains.
Distilled water to make up to	......(fluid)	10 ounces.

Use equal parts of A and B mixed at time of developing.

Ferrous-oxalate Developer.

A. Neutral oxalate of potassium	......	1200 grains.
Bromide of potassium	......	5 ,,
Citric acid	......	15 ,,
Distilled water to make up to	......(fluid)	10 ounces.
*B. Ferrous sulphate	......	1600 grains.
Citric acid	......	120 ,,
Distilled water to make up to	......(fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at time of developing.

* Should this solution after keeping change to a brown colour, discard and mix afresh.

The Mawson Opal Plate.

Developer.

A.	Neutral oxalate of potassium	1200 grains.
	Bromide of potassium	5 ,,
	Citric acid	15 ,,
	Distilled water to make up to .... (fluid)	10 ounces.
B.	Ferrous sulphate	1600 grains.
	Citric acid	120 ,,
	Distilled water to make up to .... (fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at the time of developing. Should B, after keeping, change to a brown colour, discard and mix afresh.

The Mawson Bromide Paper.

Developer.

A.	Neutral oxalate of potassium	1200 grains.
	Bromide of potassium	5 ,,
	Citric acid..	15 ,,
	Distilled water to make up to .... (fluid)	10 ounces.
B.	Ferrous sulphate	1600 grains.
	Citric acid	120 ,,
	Distilled water to make up to .... (fluid)	10 ounces.

Use 7 parts of A and 1 part of B, mixed at the time of developing. Should B, after keeping, change to a brown colour, discard and mix afresh.

THE PAGET PRIZE PLATE COMPANY'S FORMULÆ.

Pyro Ammonia.

No. 1.	Pyrogallic acid..	1 ounce.
	Citric acid	60 grains.
	Sodium sulphite (pure)	$2\frac{1}{2}$ ounces.
	Distilled water to make	20 ,,

No. 2.	Liq. ammoniæ ·880	1	ounce.
	Ammonium bromide	80	grains.
	(For Phœnix plates, 120 grains.)		
	Distilled water to make	20	ounces.

One part of each to 10 parts of water.

Pyro Soda.

No. 1.	Pyrogallic acid	¼	ounce.
	Sulphuric acid	5	drops.
	Distilled water to make	20	ounces.
No. 2.	Carbonate of soda (cryst. pure)	2	ounces.
	Sulphite of soda (pure)	2	,,
	Distilled water to make	20	,,

Equal parts of each.

Hydroquinone.

No. 1.	Hydroquinone	1	ounce.
	Methylated spirit	10	ounces.
	Sulphurous acid	½	ounce.
	Potassium bromide	¼	,,

Dissolve the hydroquinone in the spirit, and add the acid. In another vessel dissolve the potassium bromide in 3 ounces of distilled water. Mix the two solutions, and make up to 20 ounces with distilled water.

No 2.	Caustic soda (in sticks)	1	ounce.
	Sodium sulphite	5	ounces.
	Distilled water to make	20	,,

One part of each to 4 parts of water.

If this be found to give too hard a negative, use more water.

Eikonogen.

No. 1.	Eikonogen	½	ounce.
	Sodium sulphite	1½	,,
	Potassium bromide	8	grains.
	Distilled water to make	30	ounces.

Sixty grains hydroquinone added to above is a decided improvement, increasing brilliancy and density.

No. 2.	Potassium carbonate	1 ounce.
	Distilled water to make	10 ounces.

Three parts of No. 1 to one part of No. 2.

Development.

For Black Tones any of the following formulæ are suitable :—

Pyro Ammonia.

Solution No. 1.

Pyrogallic acid	1 ounce.
Sodium sulphite	1½ ,,
Citric acid	¼ ,,
Distilled water to	10 ounces.

Solution No. 2.

Liquor ammoniæ, ·880	1 ounce.
Ammonium bromide	1 ,,
Distilled water to	10 ounces.

For use, take 45 minims of each solution and make up with water to 2 ounces.

Ferrous-oxalate Developer.

Solution No. 1.

Neutral oxalate of potash	16 ounces.
Citric acid	60 grains.
Hot water	50 ounces.

Solution No. 2.

Proto-sulphate of iron	4 ounces.
Citric acid	15 grains.
Hot water	8 ounces.

Solution No. 3.

Bromide of potassium	½ ounce.
Water	10 ounces.

For development, take 6 ounces of No. 1 and add 1 ounce of No. 2 and 24 drops of No. 3. Gives cold black tones.

Eikonogen Developer.

Solution No. 1.

Eikonogen	½ ounce.
Sodium sulphite	1½ ,,
Potassium bromide	8 grains.
Distilled water to	30 ounces.

Solution No. 2.

Potassium carbonate	1 ounce.
Distilled water to	10 ounces.

Take three parts of No. 1 to one part of No. 2 solution.

Rodinal Developer.

Rodinal concentrated solution	1 part.
Water	30 parts.

This is a very clean developer, and gives a rich black colour.

Hydroquinone.

Solution No. 1.

Hydroquinone	½ ounce.
Sulphurous acid	¼ ,,
Potassium bromide	60 grains.
Water to	20 ounces.

Solution No. 2.

Caustic soda	½ ounce.
Sodium sulphite	2½ ounces.
Water to	20 ,,

For use, take ½ ounce of each to 1 ounce of water.

Warm Tones.—Developer.

Solution No. 1.

Hydroquinone	½ ounce.
Sulphurous acid	¼ ,,
Potassium bromide	60 grains.
Water to	20 ounces.

Solution No. 2.

Caustic soda	½ ounce.
Sodium sulphite	2½ ounces.
Water to	20 ,,

Solution No. 3.

Bromide of ammonium	1 ounce.
Carbonate of ammonium	1 ,,
Water to	20 ounces.

Brown.

Exposure: 60 seconds 1 foot from gas-flame, or 2 inches of magnesium wire burnt at a distance of 3 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 100 minims; water to 2 ounces. Time required in development, about 5 minutes.

Purple-brown.

Exposure: 90 seconds 1 foot from gas-flame, or 3 inches of magnesium wire burnt at a distance of 3 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 200 minims; water to 2 ounces. Time required in development, about 10 minutes.

Purple.

Exposure: 3 minutes 1 foot from gas-flame, or 8 inches of magnesium wire burnt at a distance of 2 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce: solution 3, 250 minims; water to 2 ounces. Time required in development, about 12 minutes.

Red.

Exposure: 5 minutes 1 foot from gas-flame, or 5 inches of magnesium wire burnt at a distance of 2 feet. Developer: solution 1, ½ ounce; solution 2, ½ ounce; solution 3, 300 minims; water to 2 ounces. Time required in development, about 15 minutes.

Printing-Out Opals and Lantern Plates.

Combined Toning and Fixing Bath.

No. 1 Stock.

Hyposulphite of soda	20 ounces.
Alum (potash alum only)	5 ,,
Sodium sulphate (not sulphite)	14 ,,
Water to	1 gallon.

Dissolve the hypo and alum each in about one quart of hot water, mix, and then add sodium sulphate already dissolved, making up to one gallon with remainder of water. This mixture should then be left for some hours for the precipitate to settle, when the clear solution may be poured off or filtered, and is then ready for use. It will keep indefinitely.

No. 2 Stock.

Gold chloride	15 grains.
Acetate of lead	64 ,,
Water (distilled)	8 ounces.

Dissolve the acetate of lead in the water, and add the gold. A heavy precipitate forms in this solution, which should be shaken up when any is to be poured out: it redissolves when added to No. 1 stock solution. For use: Mix 8 oz. of No. 1 with 1 oz. of No. 2. When this bath is used, the prints should *not* be washed *before* toning.

Separate Toning Bath.

Sulphocyanide of ammonium	30 grains.
Gold chloride	2½ ,,
Water	16 ounces.

Bromide Opals.

Development.

For black tones the following developer is the one chiefly used:—

Ferrous-oxalate Developer.

Solution 1.

Neutral oxalate of potash	16 ounces.
Citric acid	60 grains.
Hot water	50 ounces.

Solution 2.

Protosulphate of iron	4 ounces.
Citric acid	¼ ounce.
(Or acetic acid, ½ drachm.)	
Hot water	8 ounces.

Solution 3.

Bromide of potassium	¼ ounce.
Water	10 ounces.

For development take (when cold) 6 ounces of No. 1, and add 1 ounce of No. 2 and ½ drachm of No. 3.

For warm black tones use the hydroquinone developer, made up a follows:—

Hydroquinone Developer.

Solution 1.

Hydroquinone	½ ounce.
Sulphurous acid	¼ „
Potassium bromide	60 grains.
Water to	50 ounces.

Solution 2.

Caustic soda	½ ounce.
Sodium sulphite	2½ ounces.
Water to	50 „

For use take equal parts of the two solutions. By increasing the exposure and using less of No. 1 Solution, still browner images can be obtained. Other developers, such as eikonogen, pyro, rodinal, &c., can also be used.

ROUCH'S FORMULÆ.

A.	Pyrogallic acid	1 ounce.
	Sulphite of soda	4 ounces.
	Water, to make	10 „

Dissolve the sulphite of soda in hot water, and, when cold, add the pyrogallic acid. Should any portion of the sulphite refuse to dissolve, the crystals may be allowed to remain in the bottle.

B.	Bromide of ammonium	1 ounce.
	Water, to make	10 ounces.
C.	Strongest liquor ammoniæ	3 ounces.
	Water, to make	10 ,,

In case sulphite of soda be not readily obtainable, the following may be substituted for solution A as above, and used in the same manner:—

Pyrogallic acid	1 ounce.
Citric acid	50 grains.
Water, to make	10 ounces.

Dissolve the citric acid first, and then add the pyro.

THE SANDELL WORKS COMPANY'S FORMULÆ.

A. Pyro Potash.

No. 1.	Pyro	1 ounce or	28· grammes.
	Sulphite soda	3 ounces ,,	85· ,,
	Bromide potassium	¾ ,, ,,	21· ,,
	Citric acid	60 grains ,,	4· ,,
	Boiled or distilled water to	10 ounces ,,	300· c. c.

No. 2. Carbonate potash	2	ounces ,,	56·	grammes.
Sulphite soda	2	,,	,, 85·	,,
Boiled or distilled water to	10	,,	,, 300·	,,

B. Hydroquinone Metol.

No. 1. Hydroquinone	200 grains	or	13·	grammes.
Metol	20 ,,	,,	1·5	,,
Sulphite soda	3 ounces	,,	85·	,,
Bromide potassium	30 grains	,,	2·	,,
Citric acid	30 ,,	,,	2·	,,
Boiled or distilled water to......	20 ounces	,,	600·	,,
No. 2. Carbonate soda crystals	2 ounces	,,	56·	grammes.
Caustic soda	60 grains	,,	4·	,,
Boiled or distilled water to......	20 ounces	,,	600·	c. c.

C. Metol.

No. 1. Metol	120 grains	or	8·	grammes.
Sulphite soda	2 ounces	,,	56·	,,
Bromide potassium	129 grains	,,	8·	,,
Boiled or distilled water to......	20 ounces	,,	600·	c. c.
No. 2. Carbonate soda crystals	2 ounces	,,	56·	grammes.
Boiled or distilled water to......	20 ,,	,,	600·	c. c.

D. Pyro Ammonia.

No. 1.	Pyro	1 ounce	or	28· grammes.
	Sulphite soda	3 ounces	,,	85· ,,
	Bromide ammonium	1 ounce	,,	28· ,,
	Citric acid	120 grains	,,	8· ,,
	Boiled or distilled water to	10 ounces	,,	300· c. c.
No. 2.	Liquid ammonia, ·880	1 ounce	,,	30· c. c.
	Boiled or distilled water	10 ounces	,,	300· ,,
No. 3.	Bromide ammonium	1 ounce	,,	30· grammes.
	Boiled or distilled water	10 ounces	,,	300 c. c.

THOMAS'S FORMULÆ.

Pyrogallic Acid and Ammonia.

Stock Solutions.

No. 1.	Pyrogallic acid	1 ounce.
	Sodium sulphite	3 ounces.
	Potassium bromide	½ ounce.
	Citric acid	¼ ,,
	Distilled or boiled water to make	10 ounces.

No. 2.	Liq. ammonia ·880	1 ounce.
	Distilled or boiled water to make	10 ounces.

To make 1 ounce of developer, take 20 minims of No. 1 solution and 10 minims of No. 2 solution, and dilute with water to 1 ounce. When detail is out, add 10 minims more of No. 2 to increase density.

This formula represents 2 grains of pyro, 1 grain of potassium bromide, and 1 minim of liq. ammonia ·880 per ounce of developer. In case of under-exposure, these plates will bear the further addition of 1 minim of liq. ammonia ·880 (= 10 minims of No. 2 solution) without fogging.

Pyrogallic Acid and Soda.

Stock Solutions.

No. 1.	Pyrogallic acid	1 ounce.
	Sodium sulphite	4 ounces.
	Citric acid	¼ ounce.
	Potassium bromide	¼ ,,
	Distilled or boiled water to make	20 ounces.
No. 2.	Carbonate of soda (washing soda)	6 ounces.
	or boiled water to make	20 ,,

To make 1 ounce of developer, take 1 drachm of each solution and 6 drachms of water.

Over-exposure requires less of No. 2, and under-exposure more.

This formula represents 3 grains of pyro and 18 grains of carbonate of soda in each ounce of developer.

METOL DEVELOPER.

No. 1.	Metol	100	grains.
	Sodium sulphite	2	ounces.
	Distilled or boiled water to make	20	,,
No 2.	Carbonate of potash	¾	ounce.
	Carbonate of soda, crystals (washing soda)	1	,,
	Potassium bromide	40	grains.
	Distilled or boiled water to make	20	ounces.

For normal exposure take equal parts of each solution.
For over-exposure take less of No. 2.

HYDROQUINONE-SODA DEVELOPER.

No. 1.	Hydroquinone	160	grains.
	Sodium sulphite	2	ounces.
	Citric acid	60	grains.
	Potassium bromide	40	,,
	Distilled or boiled water to make	20	ounces.
No. 2.	Sodium hydrate	160	grains.
	Distilled or boiled water to make	20	ounces.

Take equal quantities of each solution, mixed with the same quantity of water.

In hot weather 3 or 4 grains of potassium bromide may be added to each ounce of diluted developer.

An addition of 2 or 3 grains of potassium bromide to each ounce of developer will always give a clearer and more brilliant image.

TRANSPARENCY DEVELOPERS.

Hydroquinone.

No. 1.	Hydroquinone	160	grains.
	Sodium sulphite	2	ounces.
	Citric acid	60	grains.
	Potassium bromide	40	,,
	Water to	20	ounces.
No. 2.	Sodium hydrate	160	grains.
	Water to	20	ounces.
No. 3.	Bromide ammonium	2	ounces.
	Water to	20	,,
No. 4.	Carbonate ammonium	2	ounces.
	Water to	20	,,

Pyrogallic Acid.

No. 1.	Pyrogallic acid	1	ounce.
	Sulphite soda	3	ounces.
	Citric acid	½	ounce.
	Water to	10	ounces.

No. 2.	Liq. ammonia ·880	1 ounce.
	Water to	10 ounces.
No. 3.	Bromide ammonium	1 ounce.
	Water to	10 ounces.
No. 4.	Carbonate ammonia	1 ounce.
	Water to	10 ounces.

Exposures and development formulæ with approximate time required for development at temperature of 60 degrees.

Black Tone.

Hydroquinone.

Exposure, 1 in. Mg., Distance 3 feet.

Developer No. 1		½ ounce.
„ No. 2		½ „
Water to		2 ounces.

Time, about 2 minutes.

Pyro.

Exposure, same as with Hydro.

Developer No. 1		30 minims.
„ No. 2.		30 „
„ No. 3.		30 „
Water to		2 ounces.

Time, about 2 minutes.

Brown Tone.

Hydroquinone.

Exposure, 2 in. Mg., Distance 1 foot.

Developer No. 1.	½	ounce.
,, No. 2.	½	,,
,, No. 3.	15	minims.
,, No. 4.	15	,,
Water to	2	ounces.

Time, about 7 minutes.

Pyro.

Exposure, same as with Hydro.

Developer No. 1.	30	minims.
,, No. 2.	30	,,
,, No. 3.	45	,,
,, No. 4.	45	,,
Water to	2	ounces.

Time, about 7 minutes.

Purple Tone.

Hydroquinone.

Exposure, 3 in. Mg., Distance 1 foot.

Developer	No. 1.	½ ounce.
,,	No. 2.	½ ,,
,,	No. 3.	30 minims.
,,	No. 4.	30 ,,
Water to		2 ounces.

Time, about 10 minutes.

Pyro.

Exposure, same as with Hydro.

Developer	No. 1.	30 minims.
,,	No. 2.	30 ,,
,,	No. 3.	120 ,,
,,	No. 4.	120 ,,
Water to		2 ounces.

Time, about 10 minutes.

Red Tone.

Hydroquinone.

Exposure, 6 in. Mg., Distance 1 foot.

Developer	No. 1.	½ ounce.
,,	No. 2.	½ ,,
,,	No. 3.	90 minims.
,,	No. 4.	90 ,,
Water to		2 ounces.

Time, about 15 minutes.

N.B.—For the warm tones, development must be carried much beyond what is apparently sufficient, so much is lost in fixing. A yellow light is recommended to be used, as it greatly facilitates judging of tone. It should also be mentioned that richness of tone is entirely dependent on depth to which development is carried.

Fixing Bath.

We recommend the following as giving great immunity from stain :—

Hypo	5 ounces.
Sulphite of soda	1 ounce.
Water	20 ounces
Dissolve and add sulphuric acid	1 drachm.

WRATTEN & WAINWRIGHT'S FORMULÆ.

I.—Pyrogallic Acid.

Stock Solution A.

Liquor ammoniæ, s.g. ·880	1 ounce.
Potassium bromide	60 grains.
Water	2 ounces.

*Stock Solution B.**

Pyrogallic acid	1 ounce.
Citric acid or sulphurous acid	½ drachm.
Water	10 ounces.

* For the 'Ordinary' plates, B should contain only half the quantity of pyrogallic acid.

Stock Solution C.

Potassium bromide	20 grains.
Water	1 ounce.

Stock Solution D.

Liquor ammoniæ, s. g. ·880	1 drachm.
Water	1 ounce.

II.—For Drop Shutter Special Plates.

Stock Solution B.

Pyrogallic acid	1 ounce.
Citric acid or sulphurous acid	½ drachm.
Water	10 ounces.

Stock Solution A.

Liquor ammoniæ, ·880	1 ounce.
Bromide potassium	100 or 120 grains.
Water	2 ounces.

Soda Developer.

No. 1.	Sulphite of soda	6 ounces.
	Water	80 ,,
	Sulphuric acid (pure)	1 drachm.
	Pyro	1 ounce.
No. 2.	Carbonate of soda	6 ounces.
	Water	80 ,,

Mix in equal parts for correct exposures.

THE GELATINO-CHLORIDE PROCESS.

BARKER'S FORMULA FOR PRINTING-OUT EMULSION.

Gelatine (Nelson's No. 1 and Coignet's, equal parts)	175 grains.
Chloride of ammonium	18 ,,
Rochelle salts	50 ,,
Nitrate of silver	75 ,,
Alcohol	4 drachms.
Water	5 ounces.

Heat to 100° Fahr., and allow to remain at this temperature after all is dissolved for ten minutes, after which proceed in the usual way.

Toning Baths for the Foregoing.

Wash the prints in clean water and then *tone* in the following:—

1. A. Distilled water	25 ounces.
Acetate of soda (recrystallised)	1 ounce.
Into which pour a solution of 1 per cent. of chloride of gold	2 ounces.

B. In ten ounces of distilled water, dissolve two drachms of sulphocyanide of ammonium, and add one ounce solution of 1 per cent. chloride of gold.

For toning, mix in the proportion of twenty ounces of A to six of B, if possible the evening before using.

Another.

2. A. Water	8 ounces.
Chloride of gold	2 grains.
B. Water	8 ounces.
Sulphocyanide of ammonium	40 grains.
Hyposulphite of soda	1 grain.
Carbonate of soda	3 grains.

These are mixed together by one part of A being poured into an equal part of B; in no case the reverse.

SOLIO COMBINED TONING AND FIXING BATH.

No. 1.

Hypo	20 ounces.
Alum	5 ,,
Soda sulphate	10 ,,
Potash sulphate	2 ,,
Water	160 ,,

No. 2.

Gold chloride	15 grains.
Lead acetate	64 ,,
Water	8 ounces.

For use, eight ounces of No. 1 solution; one ounce of No. 2.

A red precipitate is thrown down in the gold solution, but, if shaken before addition to the hypo, it will be redissolved.

Formula for Blue Tones.

No. 1.

Borax	600 grains.
Water	160 ounces.

No. 2.

Gold chloride	15 grains.
Water	15 ounces.

For use, eight ounces of No. 1; half ounce of No. 2. The solutions must be kept separate.

A COMBINED TONING AND FIXING BATH.

Water	20 ounces.
Hypo	5 ,,
Citric acid	60 grains.
Acetate of lead	60 ,,
Sulphocyanide of ammonium	240 ,,

These are added, and dissolved in the order given, and the solution allowed to stand for twenty-four hours. A precipitate will then be thrown down, and the clear solution decanted off. Then add—

Chloride of gold	3 grains.

ILFORD PRINTING-OUT PAPER.

Working Instructions.

Printing.—This should be done in shade by preference, unless negatives are specially strong in contrast. The image loses very little depth in toning, &c.

First washing.—For 15 minutes in several changes.

Toning.—For simplicity and excellence of results we recommend the following :—

Water	16 ounces.
Sulphocyanide of ammonium	30 grains.
Chloride of gold	2 ,,

The prints tone in this bath in about 6 minutes, and it should be borne in mind that prints dry somewhat darker and much colder than they appear when wet. The bath should not be used many times; indeed, it is well to make a stock sulphocyanide solution in bulk, and take as much of it as is needed, adding the gold as wanted. A bath with double quantity of water tends to warm tones.

Second washing.—For 5 minutes in several changes.

Fixing.—Use new solution for each batch of prints. The following is best strength :—

Hypo	3 ounces.
Water	20 ,,

Fixation is complete in about 10 minutes.

Final washing.—For at least 2 hours in running water, or many changes

Drying.—Lay the prints face upwards on the blotting paper (or hang up by clips), and allow to dry naturally. Mount with starch paste in usual way.

Alum bath.—If weather is hot, and the surface of the prints becomes soft, immerse for 10 minutes in alum bath (water, 20 ounces; alum, 2 ounces), after the first washing, and before toning, then wash for 10 minutes before putting into toning bath.

Special notes.—Do not use any excess of sulphocyanide over quantity mentioned.

Use the washing water and all solutions as cold as possible.

Keep the prints moving whilst in the various solutions.

Above remarks apply to both varieties of P.O.P., matt and glossy.

IMPERIAL P.O.P.

Directions for Use.

Hard negatives should be printed in strong light, delicate negatives only in the shade.

Prints should be rather darker than the finished picture is desired.

We specially recommend the following bath and mode of procedure for excellence and uniformity of result.

After printing, wash thoroughly for ten to fifteen minutes in running water before immersion in the Toning Solution.

In hot weather, if the surface of the prints become soft, immerse after washing, in an alum bath (alum 1 ounce, water 10 ounces), leave for ten minutes, wash again in running water for five to ten minutes and place in the following toning bath.

Sulphocyanide Toning Bath.

Stock Gold Solution.

	Chloride of gold	15 grains.
	Water (distilled or boiled) to........................	15 drachms.
No. 1.	Sulphocyanide of ammonium	75 grains.
	Water (boiled or distilled) to	20 ounces.
No. 2.	Stock gold solution....................................	5 drachms.
	Water to	20 ounces.

For use, take equal quantities of No. 1 and No. 2.

Add solution No. 2 slowly to solution No. 1, stirring all the time. Make up the solutions exactly as above, and follow out the instructions carefully.

The prints should tone in five to ten minutes.

When toning has been judged sufficient, wash for about five minutes and transfer to the following fixing bath:—

Hyposulphite of soda	3 ounces.
Water to	20 ,,

After fixation is complete (about ten minutes), wash thoroughly for one hour.

THE SYLVIO PAPER.

WELLINGTON & WARD, ELSTREE, HERTS.

The phosphate toning bath is recommended :—

Phosphate of soda	40 grains.
Gold chloride	2 ,,
Water	16 ounces.

The bath should be used as soon as it is mixed.

PAGET PRIZE GELATINO-CHLORIDE PRINTING-OUT PAPER.

ORDINARY OR MATT SURFACE.

Printing should be somewhat darker than the finished print is required.

It should be borne in mind, when toning, that the finished image will be bluer and slightly stronger when dry than in the wet state.

Toning.—The following bath is strongly recommended in preference to any other :—

Sulphocyanide of ammonia	30 grains.
Gold chloride	2½ ,,
Water	16 ounces.

Before immersion in this toning bath, the prints should be *very thoroughly washed* for at least fifteen minutes in running water. This is necessary to ensure even toning.

If the toning bath be found to tone too quickly, sulphite of soda equal in quantity to the gold used (*i.e.*, 2½ grains for above quantity) may be added. This will make the bath work more slowly, without making any other difference. More or less may be used so as to regulate to speed desired. The sulphite should be kept in a stock solution and added to the bath immediately before use.

In hot weather, if necessary, the print may be soaked in alum (alum, 4 ounces; water, 20 ounces) for five minutes before toning in this bath. Another thorough washing is necessary between the alum and toning baths.

MARIONA PAPER (P.O.P.).

Directions.—Print as with albumenised papers, slightly darker than required for the finished picture, or for partial development, as instructions below.

Washing.—After printing, wash thoroughly in several changes of water from ten to fifteen minutes.

Toning.—This paper may be toned with any of the usual baths, but the following are recommended :—

PLATINUM TONING.—FOR SEPIA TONES.

Stock Solution.

A. Potassium chloro-platinite, 15 grains in 15 ounces of water, to which have been previously added 5 minims of hydrochloric acid.

B.	Citric acid	160 grains.
	Chloride sodium	160 ,,
	Water	8 ounces.

Take 2 ounces from A and 1 ounce from B, and make up to 1½ pints with water. This is sufficient for toning two sheets.

Gold Toning.—Carbonate Bath.

A. Stock solution of gold chloride, 15 grains tube in 15 ounces of water.
B. Sodium carbonate (common washing soda), 30 grains in 15 ounces of water.

Take 2½ ounces each of A and B, and make up to 1 pint. This should tone about 2½ sheets of paper.

Gold Toning.—Sulphocyanide Bath.

A. Stock solution of gold chloride, 15 grains in 15 ounces of water.
B. Stock solution of ammonium sulphocyanide containing 15 grains to every ounce of water.

For use, take 1 ounce each of A and B, and make up to 8 or 10 ounces with water, for each sheet of paper to be toned. The bath should be fresh every time.

Washing after Toning.—To be thoroughly washed in several changes of water, then placed in the fixing bath.

Fixing Bath.—Dissolve 3 ounces of hypo in 1 pint of water. Keep the prints moving for at least 10 minutes.

Final Washing.—In running water, or several changes of water, for at least two hours.

Alum Bath.—In warm weather or hot climates it is advisable to use this bath before toning; strength about ten per cent, or chrome alum one per cent, for ten minutes, prints being again thoroughly washed before toning.

Partial Development.—This method will be found very convenient in dull weather, or even at night by magnesium or electric light. Print till the image is fairly visible, then immerse without washing in a ten per cent. solution of potassium bromide for four or five minutes. Then, after washing for a few minutes, place the print in the following developer mixed in equal proportions:—

A.	Hydroquinone	80 grains.
	Sodium sulphite	320 ,,

Make up to 1 pint with distilled water.

B.	Sodium carbonate	400 grains.
	Ammonium carbonate	400 ,,
	Ammonium bromide	40 ,,

Make up to 1 pint with distilled water.

Continue the development until all but the faintest details are visible, then immediately wash the print thoroughly in running water to remove entirely the developer before placing it in the toning bath. All after-treatment will be the same as given above for printed-out prints.

THE COLLODIO-CHLORIDE PROCESS.

PAGET PRIZE COLLODIO-CHLORIDE PRINTING-OUT PAPER.

Printing should be somewhat darker than the finished print is required; about the same as for our P.O.P., not quite so dark as for albumen.

Keeping.—Both the unprinted pieces of paper and the untoned prints are best kept in a cool place, closely packed together, flat, and under slight pressure. If left loosely exposed to the air, the collodion film may dry and harden, becoming more liable to crack during the toning and subsequent operations. Toning should be done as soon after printing as convenient; the same day, or, at farthest, the next day if possible.

Washing.—Before immersion in the toning bath, the prints should be *very thoroughly washed* for at least five minutes in running water or in three or four changes. If running water from a tap be used, it should not be turned on too violently, as it may tear or injure the film.

Alum.—After washing, it is strongly recommended that the prints be placed in an alum bath (alum, 4 ounces; water, 1 pint) for five minutes, and then washed for a quarter of an hour before toning. The alum has no action on the collodion film, but hardens the prepared paper underneath, and effectually prevents any softening or peeling in the subsequent operations. If the alum be well washed out, toning proceeds even more easily than if alum had not been used.

Toning.—Any of the ordinary toning baths employed for albumen or gelatine may be used, but no bath gives such rich, brilliant tones, either warm or cold, as the sulphocyanide. If a little care be taken to ensure clean dishes and clean fingers, there is no bath more simple or certain. We strongly recommend this bath in preference to any other.

Sulphocyanide of ammonia	30 grains.
Gold chloride	2 ,,
Water	16 ounces.

Tone to exactly the colour desired, judging the prints as they lie in the dish; but it should be borne in mind that the finished image will be slightly bluer and stronger when dry than in the wet state. Wash and fix in

Hyposulphite of soda	3 ounces.
Water	1 pint.

If this bath be found to tone too quickly, sulphite of soda may be added at the rate of ¼ to ½ grain for every grain of gold used (say 1 grain for above quantity). This will make the bath work more slowly, without making any other difference. More or less may be used, so as to regulate to speed desired. The sulphite should be kept in a stock solution, and added to the bath immediately before use.

Allow at least ten minutes for fixing. Wash thoroughly in running

water for at least an hour. Do not on any account wash longer than two hours; never leave in the water all night.

The prints may be damped off on blotting-paper and left to dry, or may be dried quickly in a moderate heat. They should *not* be left to dry *between* blotting-paper unless the latter is known to be pure. Impure blotting-paper makes spots and mottled marks on the prints.

THE ALBUMEN PROCESS.

PRESERVATIVES FOR SENSITISED ALBUMEN PAPER.

1.—Sensitise the paper in the usual bath, drain well, and when superficially dry float the back of the paper for twenty minutes on a solution of

Citric acid	1 ounce.
Water	30 ounces.

Or,

2.—Sensitise as usual, drain well, and wash the paper in three or four changes of water, then float the back on a solution of

Nitrite of potassium	5 ounces.
Water	100 ,,

When dry, roll the paper up, coated side out, and wrap in blotting-paper soaked in the nitrite of potash solution, and dried.

TONING FORMULÆ FOR ALBUMEN PRINTS.

No. 1.	Chloride of gold	1 grain.
	Acetate of soda	30 grains.
	Water	8 ounces.

This must not be used till one day after preparation. It keeps well, and gives warm, rich tones.

No. 2.	Chloride of gold	1 grain.
	Bicarbonate of soda	4 grains.
	Water	8 ounces.

This is ready for immediate use after preparation, but it will not keep.

No. 3.	Chloride of gold	1 grain.
	Phosphate of soda	20 grains.
	Water	8 ounces.

This gives rich tones of a deep purple nature, but must be used soon after preparation.

No. 4.	Gold solution	10 drachms.
	Acetate of lime	20 grains.
	Chloride of lime	1 grain.
	Tepid water	20 ounces.

The 'gold solution' before mentioned is prepared by neutralising as much as is required of a one-grain solution of chloride of gold by shaking it up with a little prepared chalk, then allowing it to settle, and filtering off the clear liquid. This toning bath improves by keeping. To use, add two ounces of it to eight ounces of tepid water, which will prove sufficient to tone a full-sized sheet of paper.

No. 5.	Chloride of gold	15 grains.
	Water	5 ounces.

Neutralise with lime water, make up to fifteen ounces with water, and add two drachms of chloride of calcium. This stock solution will keep for a long time for use. Dilute one ounce with ten ounces of water.

Toning and Fixing in One Bath.

No. 6.	Chloride of gold	1 grain.
	Phosphate of soda	15 grains.
	Sulphocyanide of ammonium	25 ,,
	Hyposulphite of soda	240 ,,
	Water	2 ounces.

Dissolve the gold separately in a small quantity of water, and add it to the other solution.

Ingall's Toning Formula.

Hard water (fluid)	20 ounces.
Bi-carbonate of potash	20 grains.
Gold	2 ,,

= 2 drachms solution 1 grain to 1 drachm hard water.

NEGATIVE INTENSIFIERS.

Monckhoven's.

1.	A.	Bromide of potassium	10 grains.
		Bichloride of mercury	10 ,,
		Water	1 ounce.
	B.	Pure cyanide of potassium	10 grains.
		Nitrate of silver	10 ,,
		Water	1 ounce.

Place the negative in A till it is white, then rinse and transfer it to solution B. If the intensification has been carried too far, it may be reduced by treatment with a weak solution of hyposulphite of soda.

MERCURY AND AMMONIA.

Pour over the negative a saturated solution of mercuric chloride (bichloride of mercury); do not keep it on too long, unless the negative is very thin. Wash well, and immerse in bath of—

Water	10 ounces.
Ammonia	10 minims.

Leave the plate in this solution until the black colour goes quite through the film.

MERCURY WITH SODIUM SULPHITE.

Whiten the negative in the saturated solution of mercuric chloride, wash and blacken with a solution of sulphite of sodium 1 in 5.

IODIDE OF MERCURY.

Dissolve one drachm of bichloride of mercury in seven ounces of water, and three drachms of iodide of potassium in three ounces of water, and pour the iodide solution into the mercury till the red precipitate formed is completely dissolved.

For use, dilute with water, flow over the negative till the proper density is reached, and wash, when the deposit will turn yellow. Remove the yellow colour by flowing a five per cent. solution of hypo over the plate, and give it the final washing.

URANIUM.

Uranium nitrate	12 grains.
Potassium ferricyanide	15 ,,
Water .... (fluid)	4 ounces.

Before using this intensifier, great care is necessary that every trace of hypo is dissolved from the film, or red fog will result.

FERRICYANIDE OF LEAD.

The negative, after washing, is placed in a solution made as follows:—

Lead nitrate	20 grains.
Ferricyanide of potassium	30 ,,
Distilled water	1 ounce.

After this it is again thoroughly washed until the drainings from the plate give a scarcely perceptible blue colour with ferrous-sulphate solution, and then ammonium sulphide (one part to ten parts of water) is poured over it.

BROMIDE OF COPPER.

A.	Potassium bromide	180 grains.
	Water	10 ounces.
B.	Cupric sulphate	240 grains.
	Water	10 ounces.

Mix the solutions, and, after standing a few hours, decant or filter out any potassium sulphate that may be precipitated. The solution will keep indefinitely, and may be used over and over again.

The *modus operandi* of intensification is the same as with the mercuric salt. The darkening or rendering sufficiently opaque of the deposit can be done by a solution of ammonia in water—say, water, 10 ounces; stronger solution of ammonia, 1 drachm. The application of any old developer will bring about the same result.

NEGATIVE REDUCERS.

FARMER'S.

Saturated solution of ferridcyanide of potassium	1 part.
Hyposulphite of soda solution, 1·5	10 parts.

L. BELITZKI'S.

Potassium ferric oxalate	1 to 10 grains.
Hyposulphite of soda solution, 1 to 5	1 ounce.

CYANIDE REDUCING SOLUTION.

Cyanide of potassium	20 grains.
Iodide of potassium	10 ,,
Bichloride of mercury	10 ,,
Water	10 ounces.

Reduction takes place slowly and is easy to control. After reducing, the negative should be washed thoroughly.

Perchloride of iron	30 grains.
Citric acid	60 ,,
Water	1 pint.

ORTHOCHROMATIC PROCESSES.

F. E. IVES'S.

Use any good bromide collodion emulsion that contains no free nitrate of silver. Flow plate as usual, and, as soon as the emulsion film sets, flow several times with strong alcoholic solution of chlorophyl from blue myrtle or plantain leaves, then immerse in water strongly tinted with blue shade eosine, and keep in motion until smooth.

Sensitises for all colours, including deep ruby red. A very light yellow screen is sufficient to secure correct rendering of colour tone.

V. SCHUMANN'S (GELATINE PLATES).

Soak the plate in 200 c. c. of water and 2 to 4 c. c. of ammonia for two to three minutes, then immerse in

Distilled water	200 c. c.
Alcohol	10 ,,
Ammonia	4 ,,
Alcoholic solution of cyanine, 1 : 500	10 ,,

DRS. MALLMANN AND SCOLIK'S (GELATINE PLATES).

Preliminary Bath.

A. Water	200 c. c.
Ammonia	2 ,,

Soak the plate for two minutes.

Colour Bath.

Erythrosine solution, 1·1000	25 c. c.
Ammonia	4 ,,
Water	175 ,,

The plate should not remain longer in this bath than one and a quarter minute. A longer time depresses the general sensitiveness.

Alcohol	500 c. c.
Chinoline red	1 gramme.

To which are added 50 c. c. of a solution of—

Alcohol	500 c. c.
Chinoline blue (cyanine)	1 gramme.

OBERNETTER'S FORMULA.

Distilled water	480 c. c.	= 16 fluid ounces.
Nitrate of silver	1·25 gramme	= 25 grains.
Ammonium carbonate	5 ,,	= 75 ,,
Erythrosine solution (1 in 500)	35 c. c.	= 1½ fluid ounces.
Strong ammonia	4 c. c.	= 1 drachm.

Bathe the plate in the preliminary solution (Mallmann and Scolik's formula) for 150 seconds.

Without washing, flow the sensitising solution over the plate twice, and dry in the dark closet.

HYPO ELIMINATORS CLEARING SOLUTIONS, &c.

TO RESTORE FADED NEGATIVES.

Mr. W. E. Debenham recommends the following solution for the purpose of restoring printing force to negatives which have faded after mercurial intensification:—

Schlippe's salt	10 grains.
Water	1 ounce.

Wet the film thoroughly by soaking in a dish of water, and immerse in the restoring solution until the desired effect is obtained.

TO REMOVE THE LAST TRACES OF HYPO FROM THE FILM.

Hydroxyl.

Peroxide of hydrogen (twenty vols.)	1 drachm.
Water	5 ounces.

After washing the negative well it is immersed for a couple of minutes in the solution and again rinsed in water, when the intensification with silver can be at once proceeded with.

Another.

Where peroxide of hydrogen is not obtainable the following may be used as a substitute, the solution containing that substance in combination with others :—

Barium dioxide	1 ounce.
Glacial acetic acid	1 ,,
Water	4 ounces.

Reduce the barium dioxide to a fine powder and add it gradually to the acid and water, shaking until dissolved. A few minutes' immersion in this solution will effectually remove or destroy the last traces of hypo.

Alum.

A simple plan brought forward by Captain Abney for this specific purpose consists in employing a saturated solution of alum in place of the solution of hydroxyl or peroxide of hydrogen.

Eau de Javelle.

Dry chloride of lime (hypochlorite of lime)	2 ounces.
Carbonate of potash	4 ,,
Water	40 ,,

Mix the chloride of lime with thirty ounces of the water; dissolve the carbonate of potash in the remainder. Mix, boil, and filter.

Labarraque's Solution.

Chloride of lime	2 ounces.
Carbonate of soda	4 ,,
Water	40 ,,

Mix the chloride of lime with thirty ounces of the water, and dissolve the carbonate of soda in the remainder. Mix, boil, and filter.

CLEARING SOLUTIONS.

Alum	2 ounces.
Citric acid	1 ounce.
Water	10 ounces.

Wash moderately after fixing, and immerse the negative in the above.

Another.

Saturated solution of alum	20 ounces.
Hydrochloric acid (commercial)	1 ounce.

Immerse the negative after fixing, having previously washed it for two or three minutes under the tap; wash well after removal from the alum and acid.

NEGATIVE VARNISHES, FORMULÆ FOR.

No. 1.	Sandarac	4 ounces.
	Alcohol	28 ,,
	Oil of lavender	3 ,,

This is a good varnish for retouching upon, as a 'tooth is easily obtained by rubbing.

No. 2.	White hard varnish	15 ounces.
	Methylated alcohol	20 to 30 ,,

This will be found a good and cheap varnish if durability is not required, as it is easily rubbed up for retouching upon and easily cleaned off. Very suitable for enlarged negatives that are not to be retained.

Tough, hard, and durable:—

No. 3.	Bleached shellac	1¼ ounce.
	Mastic	¼ ,,
	Oil of turpentine	¼ ,,
	Sandarac	1¼ ,,
	Alcohol	20 fluid ounces.

No. 4.	Sandarac	80 ounces.
	Turpentine	36 ,,
	Oil of lavender	10 ,,
	Alcohol	500 ,,

This one may be rubbed down with powdered resin, and gives a splendid surface for retouching:—

No. 5.	Sandarac	1 ounce.
	Seed lac	1½ ,,
	Castor oil	3 drachms.
	Oil of lavender	1½ drachm.
	Alcohol	18 fluid ounces.

This varnish is somewhat dark in colour.

No. 6.	Best orange shellac	2½ ounces.
	Oil of lavender or oil of turpentine	¼ ounce.
	Methylated alcohol	1 pint.

Keep in a warm place until dissolved; then add a large teaspoonful of whiting or prepared chalk; set aside to clear, and then decant. This is specially recommended for gelatine negatives.

Retouching Varnish.

Sandarac	1 ounce.
Castor oil	80 grains.
Alcohol	6 ounces.

First dissolve the sandarac in the alcohol, and then add the oil.

In the above formulæ the proportions of alcohol must be taken as approximate, as different samples of resins vary, some giving more viscous solutions than others.

Ground-glass Varnish.

Sandarac	90 grains.
Mastic	20 ,,
Ether	2 ounces.

Dissolve the resins in the ether and afterwards add

Benzole	½ to 1½ ounce.

The proportion of the benzole added determines the nature of the matt obtained.

THE WET-COLLODION PROCESS.

Pyroxyline (Hardwich).

Sulphuric acid 1·845	(fluid)	18 ounces.
Nitric acid 1·457	,,	6 ,,
Water	(fluid)	5 to 5¼ ,,
Cotton-wool		300 grains.

Temperature 150° Fahr. Time of immersion, 10 minutes.

Iodised Collodion (for Negatives).

For Acid Pyro Developer.

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	4 ,,
Pyroxyline	120 grains.
Iodide of ammonium	30 ,,
,, cadmium	45 ,,
Alcohol ·830	4 fluid ounces.

Bromo-iodised Collodion (for Negatives).

Iron Developer.

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	5 ,,
Pyroxyline	120 grains.
Iodide of ammonium	40 ,,
,, cadmium	40 ,,
Bromide of ,,	20 ,,
Alcohol ·830	5 fluid ounces.

Bromo-iodised Collodion (for Positives or Ferrotypes).

Ether, s.g. ·725	10 fluid ounces.
Alcohol, s.g. ·805	5 ,,
Pyroxyline	100 grains.
Iodide of cadmium	50 ,,
Bromide of ammonium	25 ,,
Alcohol ·830	5 fluid ounces.

Note.—The iodides should be dissolved in the weaker spirit and the pyroxyline in the ether and stronger spirit, and the two solutions mixed.

The Nitrate Bath (for Negatives)

Nitrate of silver (recrystallised)	6 ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)	8 minims.

Saturate with iodide of silver, then filter.

This is best done by coating a plate with collodion and leaving it in the bath for some hours.

(For Positives or Ferrotypes.)

Nitrate of silver (recrystallised)	5½ ounces.
Distilled water	80 fluid ounces.
Nitric acid (pure)	½ drachm.

Saturate with iodide of silver and filter as above.

DEVELOPER.

For Negatives.

No. 1.	Ferrous sulphate	½ ounce.
	Glacial acetic acid	½ ,,
	Alcohol	½ ,,
	Water	10 ounces.
No. 2.	Ammonio-sulphate of iron	75 grains.
	Glacial acetic acid	75 ,,
	Sulphate of copper	7 ,,
	Water	4 ounces.
	Alcohol	½ ounce,

For Collodion Positives or Ferrotypes.

Ferrous sulphate	150 grains.
Glacial acetic acid	½ ounce.
Nitric acid	5 minims.
Alcohol	½ ounce.
Water	10 ounces.

Note.—By increasing the proportion of nitric acid and decreasing that of the acetic, the image will be more metallic in appearance.

Nitrate of Iron Developer for Positives.

Ferrous sulphate	1½ ounce.
Nitrate of baryta	1 „
Water	1 pint.
Alcohol	1 ounce.
Nitric acid	40 drops.

The insoluble sulphate of baryta which is formed must be filtered out.

Fixing Solution for Positives.

Cyanide of potassium	½ ounce.
Water	15 to 20 ounces.

For Collodion Transfers.

Pyrogallic acid	5 grains.
Citric acid	3 „
Acetic acid	20 minims.
Water	1 ounce.
Alcohol	20 minims.

PYROXYLINE FOR DRY-COLLODION PROCESSES.

For Collodio-bromide or Unwashed Emulsion.

Nitric acid, s.g. 1·45	2 fluid ounces
Sulphuric acid, s.g. 1·845	4 „
Water	1 fluid ounce.
Cotton (cleaned and carded)	100 grains.
Temperature	150° Fahr.
Time of immersion	10 minutes.

For Washed Emulsion.

Nitric acid, s.g. 1·45	2 fluid ounces.
Sulphuric acid, s.g. 1·845	3 „
White blotting-paper	145 grains.
Temperature	100° Fahr.
Time of immersion	30 minu

THE COLLODIO-BROMIDE PROCESS.

COLLODIO-BROMIDE EMULSION.

Ether, s.g. ·720	5 fluid ounces.
Alcohol, s.g. ·820	3 „
Pyroxyline	50 grains.
Bromide of cadmium and ammonium	80 „
or Bromide of zinc	76 „

Sensitise by adding to each ounce fifteen grains of nitrate of silver, dissolved in a few drops of water and one drachm of boiling alcohol. This is suitable for slow landscape work or for transparencies.

WASHED EMULSION (for Landscapes).

No. 1.

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2¾ ,,
Pyroxyline	40 grains.
Castile soap (dissolved in alcohol)	30 ,,
Bromide of ammonium and cadmium	84 ,,

Sensitise with one hundred grains of nitrate of silver dissolved in one ounce of boiling alcohol; and, after standing ten days, add a further twenty grains of silver dissolved as before in two drachms of alcohol.

No. 2 (rapid).

Ether, s.g. ·720	4 fluid ounces.
Alcohol, s.g. ·820	2½ ,,
Pyroxyline	40 grains.
Castile soap	30 ,,
Bromide of ammonium and cadmium	56 ,,

Sensitise with 125 grains of nitrate of silver, dissolved, as before, in one ounce of alcohol with the aid of heat. In twelve hours' time add thirty grains more of the double bromide of ammonium and cadmium dissolved in half an ounce of alcohol.

FOR WASHED EMULSION (for Transparencies).

Ether, s.g. 720	5 fluid ounces.
Alcohol, s.g. ·820	3 ,,
Pyroxyline or papyroxyline	60 grains.
Bromide of cadmium and ammonium	100 ,,
or Bromide of zinc	96 ,,
Hydrochloric acid, s.g. 1·2	8 minims.

Sensitise with twenty grains of nitrate of silver to each ounce, dissolved in a minimum of water with two drachms of boiling alcohol. Allow to stand for two or three days.

N.B.—In the three last formulæ, the emulsion, after being allowed to ripen for the time stated, should be poured into a dish and allowed to become thoroughly dry. The mass of dry emulsion is then washed, to remove all the soluble salts, and is then again dried and redissolved in equal parts of ether and alcohol, at the rate of from twenty to twenty-four grains to the ounce of solvents.

DEVELOPING SOLUTIONS FOR COLLODION EMULSION.

SOLUTION A.

Pyrogallic acid	96 grains.
Alcohol	1 fluid ounce.

SOLUTION B.

Bromide of potassium	10 grains.
Water	1 fluid ounce.

SOLUTION C.

Liquor ammoniæ, s.g. ·880	1 fluid drachm.
Water	15 fluid drachms.

OR D.

Carbonate of ammonium	120 grains.
Water	1 fluid ounce.

For each drachm of developer take, for a normal exposure, five minims of A, one or two minims of B, and one or two minims of C; or, if D be used, add the above quantities of A, B, and C, to one drachm of D. When the details of the image are out, add double the quantities of B and C.

WELLINGTON'S COLLODIO-BROMIDE EMULSION FORMULÆ.

Pyroxyline	30 grains.
Ether	12 drachms.
Alcohol	12 ,,

To bromise, add 30 grains bromide ammonium dissolved in 45 minims water, to which 4 drachms of alcohol are afterwards added; 50 grains of nitrate of silver dissolved in a drachm of water are then added. After washing and drying, the pellicle is dissolved in $1\frac{3}{4}$ ounces of ether and $1\frac{3}{4}$ ounces alcohol.

DEVELOPER.

No. 1.	Pyrogallic acid	1 ounce.
	Sulphite of soda	4 ounces.
	Water	18 ,,
No. 2.	Potassium carbonate	3 ounces.
	Sulphite of soda	2 ,,
	Water	18 ,,
No. 3.	Bromide ammonium	1 ounce.
	Water	10 ,,

Use equal parts of each without dilution.

NESBIT'S FORMULÆ.

Pyroxyline	60 grains.
Methylated alcohol	$2\frac{3}{4}$ ounces.
Ether	$2\frac{1}{4}$,,
Bromide ammonium (in water 100 minims) ...	63 grains.
Alcohol	1 ounce.
Nitrate of silver	100 grains.
Water	60 minims.

After washing and drying, redissolve in alcohol 4 ounces, ether 4 ounces.

INTENSIFYING SOLUTIONS FOR COLLODION EMULSION.

Nitrate of silver	60 grains.
Citric acid	30 ,,
Nitric acid	30 minims.
Water	2 ounces.

To each drachm of a three-grain solution of pyrogallic acid add two or three minims of the above, and apply until sufficient density is attained.

GELATINE EMULSION PROCESSES.

W. K. BURTON'S FORMULA.

A. Bromide of ammonium	260 grains.
Iodide of potassium	20 ,,
Gelatine (Nelson No. 1)	80 ,,
Distilled water	10 ounces.
B. Silver nitrate (dry)	200 grains.
C. Silver nitrate	200 grains.
Distilled water	1 ounce.

Converted to ammonio-nitrate.

D. Gelatine, hard (dry)	600 grains.

BURBANK'S FORMULA.

Water	1 ounce.
Bromide of ammonium	15 to 20 grains

Or,

Bromide of potassium	18 to 25 grains.
Nitrate of silver, proportioned to the amount of bromide	25 to 30 grains.
Gelatine	30 to 40 ,,

CAPTAIN ABNEY'S FORMULA.

1. Potassium bromide	10 grains.
2. Ammonium bromide	140 ,,
3. Nelson's No. 1 gelatine	30 ,,
4. Silver nitrate	200 ,,
5. Nelson's No. 1 gelatine	80 ,,
6. Coignet's special	80 ,,

CHARLES BENNETT'S FORMULA.

Ammonium bromide	70 grains.
Silver nitrate	110 ,,
Gelatine	200 ,,
Distilled water	6 ounces.

DR. EDER'S AMMONIA FORMULA.

1. Potassium bromide	370 grains
Gelatine	520 to 700 ,,
Water	10½ ounces.
2. Silver nitrate	460 grains.
Water	10½ ounces.

Strong ammonia is added to No. 2 until the precipitate is just re dissolved.

DR. VAN MONCKHOVEN'S FORMULA.

1. Hydrobromic acid (sufficient to dissolve 150 grains of silver nitrate).	
Gelatine	40 grains.
Water	7 ounces.
2. Silver nitrate	150 grains.
Bicarbonate of soda	*q.s.* to precipitate the carbonate.
3. Gelatine	30 grains.
Water (hot)	7 ounces.

Nos. 2 and 3 are mixed and then No. 1 added, 150 grains of gelatine being finally introduced.

A. L. HENDERSON'S FORMULA.

Silver nitrate	120 grains.
Water	3 ounces.
Potassium carbonate	60 to 90 grains.
Water	3 ounces.
Potassium bromide	90 grains.
,, iodide	1 grain.
Gelatine	20 grains.

MISCELLANEOUS FORMULÆ.

THE 'DUSTING-ON' PROCESS.

No. 1.	Saturated solution of bichromate of ammonium	5 drachms.
	Honey	3 ,,
	Albumen	3 ,,
	Distilled water	20 to 30 ,,
No. 2.	Dextrine	½ ounce.
	Grape sugar	½ ,,
	Bichromate	½ ,,
	Water	½ pint.
No. 3.	Gum arabic	6 parts.
	Bichromate of potash	2·5 ,,
	Grape sugar	4 ,,
	Water	72 ,,

SILVERING MIRRORS (Martin's Method).

(*In employing the following formulæ, it should be well understood that the glass plate to be silvered must be scrupulously clean.*)

A.	Nitrate of silver	175 grains.
	Distilled water	10 ounces.
B.	Nitrate of ammonium	262 grains.
	Distilled water	10 ounces.
C.	*Pure* caustic potash	1 ounce (avoirdupois).
	Distilled water	10 ounces.
D.	Pure sugar candy	½ ounce (avoirdupois).
	Distilled water	5 ounces.

Dissolve and add—

Tartaric acid .... 50 grains.

Boil in a flask for ten minutes, and when cool add—

Alcohol .... 1 ounce.

Distilled water *quant. suff.* to make up to 10 ounces.

For use take equal parts of A and B. Mix together also equal parts of C and D, and mix in another measure. Then mix both these mixtures together in the silvering vessel, and suspend the mirror face downward in the solution.

INK FOR RUBBER STAMPS.

Aniline red (violet)	90 grains.
Boiling distilled water	1 ounce.
Glycerine	half a teaspoonful.
Treacle	half as much as glycerine.

TO RECOVER FOGGED PLATES.

Make a solution as follows:—

Chromic acid	30 grains.
Bromide of potassium	60 ,,
Water	10 ounces.

And immerse the plates for five minutes. Afterwards wash very thoroughly, and rear up to dry.

Or, instead of the above, make the following:—

Bichromate of potash	1 ounce.
Hydrobromic acid	2 drachms.
Water	10 ounces.

If hydrobromic cannot be obtained, use hydrochloric acid or a soluble bromide; in the last case a few drops of sulphuric acid being added to the solution. Use as before.

SOLUTION FOR MOUNTING PRINTS WITHOUT THEIR COCKLING.

Nelson's No. 1 photographic gelatine	4 ounces.
Water	16 ,,
Glycerine	1 ounce.
Methylated alcohol	5 ounces.

Dissolve the gelatine in the water, then add the glycerine, and lastly the spirit.

ENCAUSTIC PASTE.

Pure wax	500 parts.
Gum elemi	10 ,,
Benzole	200 ,,
Essence of lavender	300 ,,
Oil of spike	15 ,,

BACKING SHEETS FOR DRY PLATES.

Gelatine	1 part.
Water	2 parts.
Glycerine	1 part.
Indian ink	A small addition.

Make a paste, and coat strong paper; place the prepared material, face downwards, on waxed glass to set. Press to back of plate before putting into dark slide.

SENSITISING SOLUTION FOR CARBON TISSUE.

Bichromate of potash	1 ounce.
Water	20 to 30 ounces.
Liquor ammoniæ	20 minims.

A strong solution should be used for hard negatives and a more dilute one for soft negatives.

WAXING SOLUTION.

For Carbon Prints, or for Removing Collodion Films.

No. 1.	Beeswax	20 grains.
	Benzole rect. No. 1	4 ounces.

For Flexible Supports (Autotype).

No. 2.	Yellow resin	3 drachms.
	Yellow beeswax	1 drachm.
	Rectified spirits of turpentine	10 ounces.

ALBUMEN PROCESS FOR TRANSPARENCIES.

Iodised Albumen.

Albumen	10 ounces.
Liquor ammoniæ	½ drachm.
Iodide of ammonium	50 grains.
Bromide of ammonium	10 ,,

Silver Bath.

Water	10 ounces.
Nitrate silver	1 ounce.
Glacial acetic acid	1 ,,

Coat the glass with old iodised collodion and when it has set wash under the tap, drain, and coat with the albumen. When dry, sensitise for 1 minute, wash, and again dry.

Developer.

Pyrogallic acid	30 grains.
Citric acid	20 ,,
Water	10 ounces.

Use warm (120° Fahr.) and add 2 or 3 drops of a 20-grain solution of nitrate of silver per ounce at the time of using. Fix in a solution of hyposulphite of soda 4 ounces to the pint. Tone with gold if the colour is too brown.

LUBRICANT FOR BURNISHING PRINTS.

Castile soap	20 grains.
Alcohol	10 ounces.

BACKING FOR DRY PLATES TO PREVENT HALATION (Teape's).

Gum solution (ordinary office gum)	1 ounce.
Caramel	1 ,,
Burnt sienna, ground in water	2 ounces.
Mix and add alcohol	2 ,,

COLOUR FOR APPLYING TO BRIGHT MACHINERY PRIOR TO PHOTOGRAPHING IT.

Mix white lead with turpentine to the consistence of thin cream, with sufficient lamp-black to form a light slate colour, and then add one-sixth the bulk of japanners' gold size. Paint the machinery over with this. After the photograph has been taken, the colour can be quickly removed with a pledget of 'cotton waste' moistened with turpentine or benzoline.

RETOUCHING MEDIUM.

Pale resin	1 ounce.
Oil of turpentine	1 ,,
Oil of lavender	2 ounces.

TO PREVENT BLISTERS IN ALBUMEN PRINTS.

Before wetting the prints immerse them in methylated spirit, then wash and tone as usual.

TO REMOVE GELATINE NEGATIVES FROM THE GLASS.

Immerse the plate in water to which a few drops per ounce of hydrofluoric acid have been added. If the film expands, as most likely it will, immersion in spirit will bring it to its original dimensions.

PRINTING ON PLAIN PAPER.

Prepare the plain paper with

Ammonium chloride	60 to 80 grains.
Sodium citrate	100 ,,
Sodium chloride	20 to 30 ,,
Gelatine	10 ,,
Distilled water	10 ounces.

or, Ammonium chloride	100 grains.
Gelatine	10 ,,
Water	10 ounces.

The gelatine is first swelled in cold water and then dissolved in hot water, and the remaining components of the formula are added. The solution is filtered, and, when still warm, the paper floated upon it for three minutes.

The salted paper is sensitised upon a neutral 45-grain silver bath.

PLATINUM TONING BATH FOR PLAIN SILVER PRINTS.

Chloroplatinite of potassium	1 gramme.
Water	1 litre.
Nitric acid	5 to 10 drops.

INVISIBLE INK.

Chloride of cobalt	50 grains.
Distilled water	1 fluid ounce.
Glycerine	10 minims.

Dissolve the chloride of cobalt in the distilled water, and add the glycerine.

Writing executed with this ink is invisible on paper, but, on warming, the writing turns blue. On exposure to damp air it becomes invisible again.

SOLUTION FOR MAKING PAPER ADHERE TO METAL.

Tragacanth	30 grammes.
Gum arabic	120 ,,
Water	500 c. c.

To Clean Slimy Sponges.—Dissolve one ounce of fused chloride of calcium in eight ounces of water. Wet the sponge, then submerge it in the solution until the slimy substance disappears, after which wash in plain water.

Removal of Oil Stains.—Mix pipe-clay or fullers' earth with cold water to a paste, and apply some of it to the soiled spot, without friction, so as not to injure the design. After having remained there for about twelve hours, it is removed and the remains brushed off. The porous material, after the water has evaporated, soaks up at least a portion of the oil. If the stain does not disappear by one application, it is to be repeated.

To Dry a Gelatine Negative Quickly.—After being fixed and well washed lay the negative, face up, on a sheet of blotting-paper, and covering it with another sheet of blotting-paper, rub the hand all over the surface until the negative is surface dry. Then place it in a current of air for a few minutes. A cambric handkerchief or soft towel will answer instead of blotting-paper. If the negative be immersed in alcohol it will absorb and displace the water in the film, and thus permit of a quick drying by the agency of heat if necessary.

Removing Rust from a Lens.—A lens sometimes acquires a brown, rusty stain on the surface, which no amount of rubbing or cleaning will remove. By applying a paste composed of putty powder and water to the stains, and then rubbing briskly with either the point of the finger or the side of the hand, every spot of rust or stain will be removed in a few minutes. This applies to photographic or other lenses, except the object glass of a telescope, which would be irreparably damaged by such treatment.

RATES OF POSTAGE FOR INLAND LETTERS.

The rates of postage to be prepaid are as follow, viz.:—

For a letter not exceeding 1 oz.						1*d.*
,,	exceeding	1 oz.,	but not exceeding	2	ozs.	$1\frac{1}{2}$*d.*
,,	,,	2	,, ,,	4	,,	2*d.*
,,	,,	4	,, ,,	6	,,	$2\frac{1}{2}$*d.*
,,	,,	6	,, ,,	8	,,	3*d.*
,,	,,	8	,, ,,	10	,,	$3\frac{1}{2}$*d.*
,,	,,	10	,, ,,	12	,,	4*d.*
,,	,,	12	,, ,,	14	,,	$4\frac{1}{2}$*d.*

And so on at the rate of $\frac{1}{2}$*d.* for every additional two ounces.

INLAND PARCEL POST.

Every Post Office is open to the public for Parcel Post business on Week Days during the same hours as for general postal business. On Sundays Parcel Post business is not transacted.

Rates of Postage and Weight.—Three-halfpence for each pound after the first, which is threepence.

Prepayment of Postage.—All parcels must be prepaid. Limitation of Weight.—No Parcel exceeding 11 lbs. in weight can be received for transmission by Parcel Post. Limitation of Size.—No Parcel may exceed 3 ft. 6 in. in length, or 6 ft. in length and girth combined. Posting of Parcels.—Parcels must be handed in at a Post Office Counter, and must not be dropped into a Letter Box.

DEVELOPING VALUE OF THE ALKALIES.

Mr. W. B. Bolton's Table.

Caustic Soda.	Caustic Potash.	Ammonia NH_3.	Carbonate of Soda (anhydrous).	Carbonate of Soda (cryst.).	Carbonate of Potash (anhydrous).	Carbonate of Potash (cryst.).	Sesquicarbonate of Ammonia.
1	1·400	0·425	2·650	7·150	3·450	4·350	7·250
0·714	1·	0·304	1·893	5·170	2·464	3·107	5·178
2·353	3·294	1·	6·235	16·823	8·117	10·235	17·057
0·377	0·528	0·160	1·	2·698	1·301	1·641	2·736
0·140	0·196	0·059	0·370	1·	0·482	0·608	1·014
0·290	0·405	0·123	0·768	2·072	1·	1·261	2·101
0·230	0·322	0·098	0·609	1·644	0·793	1·	1·666
0·138	0·193	0·059	0·365	0·986	0·476	0·600	1·

CHEMICAL EQUIVALENCE OF THE ALKALIES.

Mr. G. E. Brown's Table.

Caustic Soda.	Caustic Potash.	Ammonia (·880 solution).	Carbonate of Soda (anhydrous).	Carbonate of Soda (cryst.).	Carbonate of Potash (anhydrous).	Carbo nate of Potash (cryst.).	Sesquicarbonate of Ammonia.
80	112	97·14	106	286	138	174	12
1	1·400	·867	1·325	3·575	1·725	2·174	1·587
·714	*1*	1·211	·946	2·553	1·232	1·554	1·134
·834	1·153	*1*	1·091	2·944	1·421	1·791	1·307
·755	1·033	·916	*1*	2·698	1·302	1·641	1·198
·280	·392	·340	·371	*1*	·483	·608	·444
·580	·812	·704	·768	2·072	*1*	1·260	·920
·460	·644	·558	·609	1·644	·793	*1*	·730
·630	·882	·765	·835	2·252	1·087	1·370	*1*

DENSITY OF AQUEOUS SOLUTION OF AMMONIA AT 15°.

(Lunge and Wiernik.

Specific Gravity.	NH_3 per Cent.	1 Litre contains NH g.	Correction of Sp. Gr. for ± 1
1·000	0·00	0·1	0·00018
0·898	0·45	4·5	0·00018
0·996	0·91	9·1	0·00019
0·994	1·37	13·6	0·00019
0·992	1·84	18·2	0·00020
0·990	2·31	22·9	0·00020
0·988	2·80	27·7	0·00021
0·986	3·30	32·5	0·00021
0·984	3·80	37·4	0·00022
0·982	4·30	42·2	0·00022
0·980	4·80	47·0	0·00023
0·978	5·30	51·8	0·00023
0·976	5·80	56·6	0·00024
0·974	6·30	61·4	0·00024
0·972	6·80	66·1	0·00025
0·970	7·31	70·9	0·00025
0·968	7·82	75·7	0·00026
0·966	8·33	80·5	0·00026
0·964	8·84	85·2	0·00027
0·962	9·35	89·9	0·00028
0·960	9·91	95·1	0·00029
0·958	10·47	100·3	0·00030
0·956	11·03	105·4	0·00031
0·954	11·60	110·7	0·00032
0·952	12·17	115·9	0·00033
0·950	12·74	121·0	0·00034
0·948	13·31	126·2	0·00035
0·946	13·18	131·3	0·00036
0·944	14·46	136·5	0·00037
0·942	15·04	141·7	0·00038

To Reduce Over-printed Proofs.—Immerse the prints in a solution composed of five grains of cyanide of potassium and five drops of liquor ammonia to a pint of water. Allow them to remain until a sufficient degree of reduction has been effected and then wash carefully.

To Blacken the Brass Work of Lenses.—The diaphragms of lenses ought not to be blackened by the dead-black varnish which is employed on the cells and the inside of a tube, as it would invariably chip off and produce a worse effect than if left untouched. They ought to be stained, by being first made quite clean and then receiving an application of a solution of nitrate of silver and nitrate of copper, heat being then applied.

DENSITY OF AQUEOUS SOLUTION OF AMMONIA AT 15°.—*Continued.*

(LUNGE AND WIERNIK.)

Specific Gravity.	NH_3 per Cent.	1 Litre contains NH_3 g.	Correction of Sp. Gr. for ± 1°.
0·940	15·63	146·9	0·00039
0·938	16·22	152·1	0·00040
0·936	16·82	157·4	0·00041
0·934	17·42	162·7	0·00041
0·932	18·03	168·1	0·00042
0·930	18·64	173·4	0·00042
0·928	19·25	178·6	0·00043
0·926	19·87	184·2	0·00044
0·924	20·49	189·3	0·00045
0·922	21·12	194·7	0·00046
0·920	21·75	200·1	0·00047
0·918	22·39	205·6	0·00048
0·916	22·03	210·9	0·00049
0·914	23·68	216·3	0·00050
0·912	24·33	221·9	0·00051
0·910	24·99	227·4	0·00052
0·908	25·65	232·9	0·00053
0·906	26·31	238·3	0·00054
0 904	26·98	243·9	0·00055
0·902	27·65	249·4	0·00056
0·900	28·33	255·0	0·00057
0·898	29·01	260·5	0·00058
0·896	29·69	266·0	0·00059
0·894	30·37	271·5	0·00060
0·892	31·05	277·0	0·00060
0·890	31·75	282·6	0·00061
0·888	32·50	288·6	0·00062
0·886	33·25	294·6	0·00063
0·884	34·10	301·4	0·00064
0·882	34·95	308·3	0·00065

TO PREPARE AN ILLUSTRATION FOR THE LANTERN.—A lecturer may prepare a diagram in a few minutes by coating thin glass or mica with benzole varnish to which a few drops of indiarubber solution have been added. This dries transparent, but allows of the finest writing being made on it by means of a steel pen and India ink. By placing it upon an engraving, the leading features may be quickly and accurately traced in outline.

TO MAKE INK FOR LABELS THAT WILL NOT BE AFFECTED BY ACIDS.—Make a mixture of one part pure Trinidad asphaltum, with four parts of oil of turpentine, coloured with plumbago.

TABLES FOR THE SIMPLIFICATION OF EMULSION CALCULATIONS.

WITH a view of simplifying the calculations involved in emulsion-making, the late Mr. William Ackland a few years ago worked out some useful tables, which will enable even those most ignorant of chemical philosophy to calculate with ease and rapidity the proper quantities of silver or haloid salts in any formula. Even those who are able to perform the calculations in the recognised style will find their labours materially lightened by means of these tables, which should be kept in a convenient place for reference in every laboratory.

No. I.

	Equivalent weights.	Weight of $AgNO_3$ required to convert one grain of soluble haloid.	Weight of soluble haloid required to convert one grain $AgNO_3$.	Weight of *silver* haloid produced by one grain of *soluble* haloid.	Weight of *soluble* haloid required to produce one grain of *silver* haloid.	Weight of silver haloid produced from one grain $AgNO_3$.
Ammonium bromide	98	1·734	·576	1·918	·521	1·106
Potassium ,, ...	119·1	1·427	·700	1·578	·633	
Sodium ,, ...	103	1·650	·606	1·825	·548	
Cadmium ,, com.	172	·988	1·012	1·093	·915	
,, ,, anh.	136	1·25·	·800	1·382	·723	
Zinc ,, ...	112·1	1·509	·663	1·670	·600	
Ammonium chloride	53·5	3·177	·315	2·682	·373	·844
Sodium ,, ...	58·5	2·906	·344	2·453	·408	
Ammonium iodide	145	1·172	·853	1·620	·617	1·382
Potassium ,, ...	166·1	1·023	·977	1·415	·707	
Sodium ,, ...	150	1·133	·882	1·566	·638	
Cadmium ,, ...	183	·929	1·076	1·284	·778	

The principal bromides, chlorides, and iodides which are likely to be used in emulsions of either gelatine or collodion have been included in these tables. Table No. I. presents to the reader, without any mystification which may be involved in equivalents, the actual weights of haloid or silver, as the case may be, required to convert or combine with one grain of the other.

In order to test the utility of this table, let us suppose that it is desired to make (say) ten ounces of emulsion by a new formula, which, for the sake of showing the working of the table, we will write down as follows :—

Bromide of potassium .... 150 grains.
Iodide of potassium .... 10 ,,
Chloride of ammonium .... 10 ,,
Gelatine .... 200 ,,

Now we want to know how much silver nitrate should be employed in sensitising this mixture. For this purpose we use the first column, in which we find against each haloid the exact quantity of silver nitrate required to fully decompose one grain. Taking, then, the figures we find in column No. 1 against the three salts in the above formula, and multiplying them by the number of grains of each used, we have the following sum :—

$$\left.\begin{array}{lr} \text{Potassium bromide .... } 150 \times 1{\cdot}427 = & 214 \\ \text{,, iodide .... } 10 \times 1{\cdot}023 = & 10{\cdot}23 \\ \text{Chloride of ammonium ... } 10 \times 3{\cdot}177 = & 31{\cdot}77 \end{array}\right\} \text{Weight silver nitrate required,}$$

or the total quantity of silver nitrate required for full conversion, 256·00 grains.

No. II.

	Ammonium Bromide.	Potassium Bromide.	Sodium Bromide.	Cadmium Bromide. (Coml.)	Cadmium Bromide. (Anhyd.)	Zinc Bromide.	Ammonium Chloride.	Sodium Chloride.	Ammonium Iodide.	Potassium Iodide.	Sodium Iodide.	Cadmium Iodide.
Ammonium bromide...........	**1**	·823	·951	·57	·72	·87	1·832	1·675	·676	·59	·653	·535
Potassium ,, ...	1·215	**1**	1·156	·692	·876	1·058	2·226	2·036	·821	·717	·794	·651
Sodium ,, ...	1·051	·865	**1**	·599	·757	·915	1.925	1·761	·71	·62	·686	·563
Cadmium ,, com.	1·755	1·444	1·67	**1**	1·265	1·527	3·215	2·94	1·186	1·035	1·146	·94
,, ,, anh.	1·387	1·141	1·32	·79	**1**	1·207	2·542	2·324	·938	·819	·906	·743
Zinc ,, ...	1·149	·945	1·093	·655	·828	**1**	2·104	1·925	·776	·678	·75	·615
Ammonium chloride...........	·546	·449	·519	·311	·393	·475	**1**	·914	·369	·322	·356	·292
Sodium ,, ...	·597	·491	·568	·34	·43	·519	1·093	**1**	·403	·352	·39	·319
Ammonium iodide..............	1·479	1·217	1·408	·843	1·066	1·287	2·712	2·478	**1**	·873	·966	·792
Potassium ,, ...	1·695	1·394	1·612	·965	1·221	1·475	3·104	2·839	1·145	**1**	1·107	·907
Sodium ,, ...	1·53	1·259	1·456	·872	1·103	1·332	2·803	2·564	1·034	·903	**1**	·819
Cadmium ,, ...	1·867	1·536	1·776	1·064	1·345	1·625	3·42	3·128	1·262	1·102	1·22	**1**

TABLE No. II. gives in separate columns the relative converting values of each of the soluble haloid salts in ordinary use, showing how much of any salt must be used to replace one grain of any other. In each column will be found a unit (printed in larger type) which represents one grain of the salt named at the head of the column; the other figures in the same column show the exact quantities of the other salts which must be used in lieu of a single grain of that particular haloid. Thus, taking the first column, which is headed 'Ammonium Bromide,' we find against ammonium bromide in the margin the figure 1, representing one grain of that salt. If we wish to know the relative converting power of potassium bromide we take the number in the same column which stands against the latter salt in the margin, viz., 1·215; that is to say, 1·215 grain of potassium bromide will be required to do the same work as one of NH_4Br.

SOLUBILITY OF THE SILVER HALOIDS.

By E. Valenta.

In the *Royal Photographic Society's Journal* the following table, the result of a series of experiments, is given.

Solvent.	Concentration.	100 g. of solution can dissolve in grammes. Ag Cl.	Ag Br.	Ag I.	Remarks.
Sodium hyposulphite	1 : 100	0·40	0·35	0·03	
,,	5 : 100	2·00	1·90	0·15	
,,	10 : 100	4·10	3·50	0·30	The estimations were made at 20° C.
,,	15 : 100	5·50	4·20	0·40	
,,	20 : 100	6·10	5·80	0·60	
Ammonium hyposulphite	1 : 100	0·57	—	—	For bromide and iodide of silver similar results were obtained as with sodium hyposulphite.
,,	5 : 100	1·32	—	—	
,,	10 : 100	3·92	—	—	
Sodium sulphite	10 : 100	0·44	0·04	0·01	
,,	20 : 100	0·95	0·08	0·02	
Ammonium sulphite	10 : 100		traces		
Ammonium carbonate	10 : 100	0·05	—	—	
Ammonia	3%	1·40	—	—	
,,	15%	7·58	—	—	
Magnesium chloride	50 : 100	0·50	—	—	
Potassium cyanide	5 : 100	2·75	6·55	8·23	25° C.
Ammonium sulphocyanide	5 : 100	0·08	0·21	0·02	
,,	10 : 100	0·54	2·04	0·08	23° C.
,,	15 : 100	2·88	5·30	0·13	
Potassium sulphocyanide	10 : 100	0·11	0·73	—	25° C.
Calcium sulphocyanide	10 : 100	0·15	0·53	0·03	
Barium sulphocyanide	10 : 100	0·20	0·35	0·02	
Aluminium sulphocyanide	10 : 100	2·02	4·50	0·02	
Thiocarbamide	10 : 100	0·83	1·87	0·79	25° C.
Thiosinamin	1 : 100	0·40	0·08	0·008	
,,	5 : 100	1·90	0·35	0·05	
,,	10 : 100	3·90	0·72	0·09	

TABLE OF THE SYMBOLS, ATOMIC AND EQUIVALENT WEIGHTS OF THE ELEMENTS.

Name.	Symbol.	Atomic Weight.	Equivalent Weight.
Aluminium	Al	27·02	9·007
Antimony	Sb	120·	40·
Arsenic	As	74·9	24·97
Barium	Ba	136·8	68·4
Beryllium	Be	9·08	4·54
Bismuth	Bi	208·	69·33
Boron	B	10·9	3·66
Bromine	Br	79·75	79·75
Cadmium	Cd	112·	56·
Cæsium	Cs	133·	132·7
Calcium	Ca	39·9	19·95
Carbon	C	11·97	2·99
Cerium	Ce	139·9	46·6
Chlorine	Cl	35·37	35·37
Chromium	Cr	52·4	26·2
Cobalt	Co	59·	29·5
Copper	Cu	63·2	31·6
Didymium	Di	143·	47·8
Erbium	E	165·9	55·3
Fluorine	F	19·1	19·1
Gallium	Ga	69·	23·
Gold	Au	197·	65·66
Hydrogen	H	1·	1·
Indium	In	113·4	37·8
Iodine	I	126·53	126·53
Iridium	Ir	192·5	48·125
Iron	Fe	55·9	27·95
Lanthanum	La	138·5	46·17
Lead	Pb	206·4	103·2
Lithium	Li	7·01	7·01
Magnesium	Mg	24·	12·
Manganese	Mn	55·	27·5
Mercury	Hg	199·8	99·9
Molybdenum	Mo	95·8	19·16
Nickel	Ni	58·6	29·3
Niobium	Nb	94·	31·33
Nitrogen	N	14·01	4·67
Osmium	Os	193·	24·125
Oxygen	O	15·96	7·98
Palladium	Pd	106·2	26·55
Phosphorus	P	30·96	10·32
Platinum	Pt	194·3	48·575

TABLE OF SYMBOLS, &c.—Continued.

Name.	Symbol.	Atomic Weight.	Equivalent Weight.
Potassium	K	39·04	39·04
Rhodium	Ro	104·	26·
Rubidium	Rb	85·2	85·2
Ruthenium	Ru	104·4	26·1
Selenium	Se	78·8	39·4
Silicon	Si	28·3	7·
Silver	Ag	107·66	107·66
Sodium	Na	23·	23·
Strontium	Sr	87·3	43·65
Sulphur	S	31·98	15·99
Tantalum	Ta	182·	60·67
Tellurium	Te	125·	62·5
Thallium	Tl	203·64	203·64
Thorium	Th	231·87	57·97
Tin	Sn	117·8	58·9
Titanium	Ti	48·0	12·
Tungsten	W	183·6	30·6
Uranium	U	240·	60·
Vanadium	V	51·2	17·07
Yttrium	Y	89·6	29·87
Zinc	Zn	65·2	32·6
Zirconium	Zr	90·	45·

FREEZING MIXTURES.

The following mixtures will be found useful where ice is not readily obtainable—

	Ingredients.	Parts by Weight.	The Temperature at starting being 50° Fahr. the thermometer sinks.	Diminution of Temperature.
1	Water	1	From + 50° to + 4°	46° Fahr.
	Nitrate of ammonia	1		
2	Water	16	„ + 50° „ +10°	40° „
	Saltpetre	5		
	Chloride of ammonium (sal ammoniac)	5		
3	Water	1	„ + 50° „ + 7°	43° „
	Nitrate of ammonia	1		
	Carbonate of soda	1		
4	Snow	2	„ 32° „ − 5°	37° „
	Chloride of sodium	1		
5	Snow	2	„ + 32° „ − 50°	82° „
	Crystallised chloride of calcium	3		
	Crystallised sulphate of soda	8	„ + 50° „ 0°	50° „
	Hydrochloric acid	5		

TABLE OF SYMBOLS OF THE MORE IMPORTANT COMPOUNDS USED IN PHOTOGRAPHY.

Name.	Symbol.	
Acid, Acetic (Cryst.)	$H, C_2 H_3 O_2$	60
,, Citric	$H_3, C_6 H_5 O_7 + H_2 O$	210
,, Formic	H, CHO_2	46
,, Gallic	$H, C_7 H_5 O_5$	170
,, Hydriodic	HI	128
,, Hydrobromic	$H Br$	81
,, Hydrochloric	$H Cl$	36·5
,, Hydrocyanic	$H CN$	27
,, Hydrosulphuric	$H_2 S$	34
,, Nitric	H, NO_3	63
,, Oxalic	$H_2 C_2 O_4 + 2 H_2 O$	126
,, Pyrogallic	$H_3 C_6 H_3 O_3$	126
,, Sulphuric	$H_2 SO_4$	98
,, Sulphurous	$H_2 SO_3$	82
,, Tannic	$H_4 C_{27} H_{18} O_{17}$	618
,, Tartaric	$H_4 C_4 H_2 O_6$	150
Alcohol, Methyl	$CH_4 O$	32
Alum, Chrome	$Cr K (SO_4)_2 12 H_2 O$	499·3
,, (Potash)	$Al K (SO_4)_2 12 H_2 O$	474·5
Amidol	$C_6 H_8 N_2 O$	17
Ammonium, Bichromate	$(NH_4)_2 Cr_2 O_7$	252
,, Bromide	$NH_4 Br$	98
,, Carbonate	$(NH_4)_2 CO_3$	96
,, Chloride	$NH_4 Cl$	53·5
,, Iodide	$NH_4 I$	145
,, Nitrate	NH_4, NO_3	80
,, Oxalate	$(NH_4)_2 C_2 O_4$	124
,, Sulphide of	NH_4, HS	51
,, Sulphocyanide of	NH_4, CNS	76
Barium, Bromide	$Ba Br_2$	297
,, Chloride (Cryst.)	$Ba, Cl_2 + 2 H_2 O$	244
,, Iodide	$Ba I_2$	391
,, Nitrate	$Ba, (NO_3)_2$	261
Benzole	$C_6 H_6$	78
Boracic Acid	$H_3 BO_3$	62
Cadmium, Bromide (Cryst.)	$Cd, Br_2 + 4 H_2 O$	344
,, Chloride	$Cd Cl_2$	183
,, Iodide	$Cd I_2$	366
Calcium, Bromide (Cryst.)	$Ca Br_2 + 4 H_2 O$	272
,, Chloride	$Ca Cl_2$	111
,, Iodide	$Ca I_2$	294
Camphor	$C_{10} H_{16} O$	152
Carbolic Acid	$C_6 H_6 O$	94
Copper, Bromide (cupric)	$Cu Br_2$	223·4
,, Chloride ,,	$Cu Cl_2 2 H_2 O$	170·4
,, Sulphate ,,	$Cu SO_4 5 H_2 O$	249·4

TABLES OF SYMBOLS, &c.—Continued.

Name.	Symbol.	
Dextrine	$C_6\ H_{10}\ O_5$	162
Eikonogen	$C_6\ H_{10}\ O_5$	261
Gold, Terchloride	$Au\ Cl_3$	302·5
Hydroquinone	$C_6\ H_6\ O_2$	110
Iridium, Perchloride	$Ir\ Cl_4$	335
Iron, Chloride (ferrous)	$Fe\ Cl_2$	127
,, ,, (ferric)	$Fe_2\ Cl_6$	325
,, Citrate	$Fe_2\ (C_6\ H_5\ O_7)_2$	598
,, Iodide	$Fe\ I_2$	310
,, Oxalate (ferrous)	$Fe\ C_2\ O_4$	144
,, ,, (ferric)	$Fe_2\ (C_2\ O_4)_3$	376
,, Sulphate (ferrous)	$Fe\ SO_4 + 7\ H_2\ O$	278
,, ,, (ferric)	$Fe_2\ (SO_4)_3$	400
,, Ammonia-sulphate	$Fe\ SO_4,\ (NH_4)_2\ SO_4 + 6\ H_2\ O$	392
Kaolin	$H_2\ Al_2\ Si_2\ O_8 + H_2\ O$	258·8
Lead, Acetate (Cryst.)	$Pb,\ (C_2\ H_3\ O_2)_2 + H_2\ O$	343
,, Nitrate	$Pb,\ (NO_3)_2$	331
Lithium, Bromide	$Li\ Br$	87
,, Chloride	$Li\ Cl$	42·5
,, Iodide	$Li\ I$	134
Magnesium, Bromide	$Mg\ Br_2$	184
,, Chloride	$Mg\ Cl_2$	95
,, Iodide	$Mg\ I_2$	278
Mercury, Chloride (Mercuric)	$Hg\ Cl_2$	271
Metol	$C_8\ H_{11}\ NO$	137
Nitrous Acid	$H\ NO_2$	63
Para-amidophenol	$C_6\ H_7\ NO$	109
Platinum, Chloride	$Pt\ Cl_4$	339·4
Potassium, Acetate	$K\ C_2\ H_3\ O_2$	98·1
,, Bichromate	$K_2\ Cr_2\ O_7$	294·6
,, Bromide	$K\ Br$	119·1
,, Carbonate	$K_2\ CO_3$	138·2
,, Chloride	$K\ Cl$	74·6
,, Citrate	$K_3\ C_6\ H_5\ O_7 + H_2\ O$	324·3
,, Cyanide	$K\ C\ N$	65·1
,, Ferridcyanide	$K_6\ Fe_2\ Cy_{12}$	658·6
,, Ferrocyanide	$K_4\ Fe\ Cy_6$	368·4
,, Hydrate	$K\ OH$	56·1
,, Iodide	$K\ I$	166·1
,, Nitrate	$K\ NO_3$	101·1
,, Oxalate	$K\ C_2\ O_4\ H_2\ O$	235
,, Permanganate	$K_2\ Mn_2\ O_8$	316·[illegible]
,, Sulphocyanide	$K\ Cy\ S$	97
Salicylic Acid	$C_7\ H_6\ O_3$	138
Silver, Acetate	$Ag\ C_2\ H_3\ O_2$	167
,, Bromide	$Ag\ Br$	188
,, Carbonate	$Ag_2\ CO_3$	276

TABLES OF SYMBOLS, &c.—Continued.

Name.	Symbol.	
Silver, Chloride	$Ag\ Cl$	143·5
,, Citrate	$Ag_3\ C_6H_5O_7$	513
,, Fluoride	$Ag\ Fl$	127
,, Iodide	$Ag\ I$	235
,, Nitrate	$Ag\ NO_3$	170
,, Oxalate	$Ag_2\ C_2\ O_4$	304
,, Oxide	$Ag_2\ O$	232
,, Sulphide	$Ag_2\ S$	248
Sodium, Acetate (Cryst.)	$Na\ C_2\ H_3\ O_2\ 3\ H_2\ O$	136
,, Biborate (Borax)	$Na_2\ B_4\ O_7 + 10\ H_2\ O$	382
,, Bicarbonate	$Na\ H\ C\ O$	84
,, Bromide	$Na\ Br$	103
,, Carbonate (Cryst.)	$Na_2\ CO_3 + 10\ H_2\ O$	286
,, Chloride	$Na\ Cl$	58·5
,, Citrate	$2\ (Na_3\ C_6\ H_5\ O_7)\ 11\ H_2\ O$	714
,, Hydrate	$Na\ H\ O$	40
,, Hyposulphite (Cryst.)	$Na_2\ S_2\ O_3 + 5\ H_2\ O$	248
,, Iodide	$Na\ I$	150
,, Sulphite	$Na_2\ SO_3\ 7\ H_2\ O$	252
Strontium, Bromide	$Sr\ Br_2$	247·5
,, Chloride	$Sr\ Cl_2$	158·5
,, Iodide	$Sr\ I_2$	341·5
Thymol	$C_6\ H_3\ (C\ H_3)\ (C_3\ H_7)\ C\ O\ O$	177
Tin, Chloride (stannous)	$Sn\ Cl_2\ 2\ H_2\ O$	225
,, ,, Stannic	$Sn\ Cl_4$	260
Uranium, Bromide	$U\ Br_2\ 4\ H_2\ O$	352
,, Nitrate	$U_2\ O_2\ (NO_3)_2\ 6\ H_2\ O$	504
Zinc, Bromide	$Zn\ Br_2$	225·2
,, Chloride	$Zn\ Cl_2$	136·2
,, Iodide	$Zn\ I_2$	319·2

To Ascertain the Strength of a Silver Solution.—If the solution contain nothing but nitrate of silver, then may the argento-hydrometer be employed in the certainty of its affording a fairly accurate idea of the number of grains of the salt contained in each ounce of water. But this specific-gravity test quite fails in the case of a silver solution which, from having been long in use, contains other matters. In this case a test solution, composed of pure chloride of sodium eight and a half grains, dissolved in six ounces of distilled water, must be prepared. To use it, place one drachm of the bath solution in a two-ounce bottle, rinsing out the minim measure with a drachm of distilled water and adding to the other. Pour in the salt solution slowly and with occasional shaking until no further precipitate takes place. Having noted how many drachms it has taken to effect this end, multiply this number by four for the weight in grains of the nitrate of silver present in an ounce of the bath solution. If pure chloride of sodium be not procurable, commercial chloride of ammonia may be substituted, seven and three-quarter grains being dissolved in six ounces of water.

TABLE OF THE SOLUBILITIES OF THE PRINCIPAL SUBSTANCES USED IN PHOTOGRAPHY.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Acid, Boracic (Anhydrous)	47·01	...	2·13	soluble
„ „ (Cryst.)	25·66	3·0	3·9	sol. in 6 parts @ 60°
„ Citric	0·75	0·5	133·0	sol. in 1·15 pt. s. g. 820
„ Gallic	100·0	3·0	1·0	soluble in 4 parts
„ Oxalic	15·5	1·0	6·47	insoluble
„ Pyrogallic	2·25	...	...	sol. in alc. and ether
„ Salicylic	87·2	vry sol	0·35	easily soluble
„ Succinic	5·0	2·2	20·0	soluble in 3 parts
„ Tannic	very	solubl	e	sol. in alc. and ether
„ Tartaric	·66	·5	150·0	soluble
Alum (Potash)	10·5	vry sol	9·52	insoluble
„ (Ammonia)	7·32	„	13·66	„
Amidol	very	solubl	e	
Ammonium, Bromide	1·4	0·78	41·1	sol. in 32·3 parts
„ Carbonate	3·3	·833	33·0	insoluble
„ Chloride	2·7	1·00	37·02	sparingly soluble
„ Citrate	deliqu	escent	vy. sol.	less sol. in alcohol
„ Iodide	very	solubl	e	soluble
„ Nitrate	2·0	1·0	50·0	freely soluble
„ Oxalate	4·0	2·0	...	soluble
„ Salicylate	very	solubl	e	
„ Succinate	„	„		
„ Sulphocyanide	deliqu	escent	easily	sol. in water and alc.
Barium, Bromide	·96	...	104·2	easily soluble
„ Chloride { Crystallised	2·18	...	46·0	very slightly soluble
„ Chloride { Anhydrous.	2·862	...	34·1	
„ Iodide	0·48	0·35	208·3	easily soluble
„ Nitrate	12·2	2·84	8·18	
Cadmium, Bromide	easily	solubl	e	easily soluble
„ Chloride	0·71	0·67	...	„
„ Iodide	1·08	0·75	92·6	very soluble
Calcium, Bromide (Cryst.)	0·97	...	102·56	easily soluble
„ Chloride	0·25	any qy	400·0	
„ Iodide	deliqu	escent		
Cobalt, Chloride	very	solubl	e	sol. in alc. and ether
Copper, Bromide (Cupric)	deliqu	escent	vy. sol.	„ „
„ Chloride „	„	„	„	„ „
„ Nitrate	solubl	e	...	very soluble
„ Sulphate	2·5	...	40·0	insoluble
Eikonogen	40·0	vry sol	...	soluble
Gold, Perchloride	deliqu	escent	vy. sol.	soluble in ether

TABLE OF THE SOLUBILITIES, &c.—Continued.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Iron, Chloride (Ferrous) Anhyd. ...	2·0	...	50·0	sol. in 1 part alcohol
Iron, Chloride (Ferrous) Hydrated .	0·68	...	147·0	easily soluble
,, Chloride (Ferric)	very	del. &	sol.	very soluble
,, Oxalate ,, ...	insolu	ble, ex	cept in	excess of oxalic acid
,, Sulphate ,, ...	solubl	e	...	soluble
,, ,, (Ferrous) ...	1·3	·30	77·0	insoluble
Lead, Acetate	3·7	3·45	27·0	soluble in 12·5 parts
,, Nitrate	7·7	...	13·0	
Lithium, Bromide	0·66	...	149·8	soluble
,, Chloride	1·315	...	76·0	
,, Iodide	0·61	...	164·0	
Magnesium, Bromide	deliqu	escent	vy. sol.	very soluble
,, Chloride	1·857	...	53·8	
,, Iodide	deliqu	escent	vy. sol.	soluble
,, Sulphate	1·47	0·66	68·04	slightly soluble
Mercury, Chloride .... (Mercuric)	16·0	3·0	6·25	soluble in 2·35 parts
Platinum, Bichloride.........	solubl	e	...	easily sol. in alc. & ether
Potassium, Bichromate ...	10·0	...	10·0	
,, Bromide	1·55	...	64·5	
,, Carbonate	0·9	...	111·0	
,, Chloride	3·03	2·0	33·0	slightly soluble
,, Citrate	very	solubl	e	
,, Cyanide	deliqu	escent	vy. sol.	insol. in pure alcohol
,, Ferrocyanide ...	3·0	1·0	33·3	insoluble
,, Ferridcyanide ...	2·54	1·22	39·37	very sparingly soluble
,, Hydrate	0·5	...	200·0	very soluble
,, Iodide	0·7	0·27	143·0	sol. in 40 pts. abs. alc.
,, Nitrate...........	3·5	0·4	28·57	insoluble
,, Nitrite	deliqu	& solu	ble	
,, Oxalate(neutral)	3·0	...	33·3	slightly soluble
,, ,, (bin.) ...	40·0	...	2·5	insoluble
,, ,, (quad.)..	20·17	...	4·95	insoluble
,, Permanganate..	16·0	...	6·25	insoluble
,, Sulphocyanide. .				
Silver, Acetate	very	slightl	y sol.	
,, Citrate.................	solubl	e in wa	rm wate	r
,, Fluoride	deliqu	escent		
,, Nitrate	1·0	0·5	100·0	sol. in 4 pts. boiling alc.
,, Nitrite	300·0	dissol. easily	0·33	insoluble
,, Oxalate	spar'ly sol.	solubl	e	insoluble

TABLE OF THE SOLUBILITIES, &c.—Continued.

	One part is soluble in — parts of water. Cold.	Boiling.	100 parts of water dissolve at ordinary temperature.	Solubility in Alcohol.
Silver, Sulphate	200·0	88·0	0·5	insoluble
Sodium, Acetate (Cryst.)	2·86	·66	35·0	
,, Biborate (Borax)	12·44	2·0	8·033	insoluble
,, Bromide	1·13	...	88·5	
,, Carbonate (Cryst.)	2·0	1·0	50·0	insoluble
,, ,, (Anhyd.)	3·85	2·07	25·93	insoluble
,, Chloride	2·77	2·77	36·0	sparingly soluble
,, Citrate	1·0	...	100·0	sparingly soluble
,, Hydrate	1·65	...	60·63	easily soluble
,, Hyposulphite (Thiosulphate)	deliqu	escent	vy. sol.	insoluble
,, Iodide	0·55	0·3	180·0	sparingly soluble
,, Nitrate	1·136	...	88·03	sol. in 37 parts alc.
,, Nitrite	deliqu	escent	vy. sol.	very soluble
,, Phosphate	4·0	2·0	25·0	
,, Succinate	very s	oluble		
,, Sulphate	2·08	0·41	48·0	soluble
,, Sulphite	4·0	...	25·0	slightly soluble
,, Bisulphite	very s	oluble	...	insoluble
,, Sulphocyanide				
,, Tartrate	1·75	...	56·37	insoluble
,, Tungstate	4·0	2·0	25·0	
Strontium, Bromide	1·01	...	99·0	sparingly soluble
,, Chloride	1·88	...	53·0	feebly soluble
,, Iodide	0·56	0·27	178·5	
Uranium, Bromide (Hydrated)	deliqu	& solu	ble	soluble
,, Nitrate	0·5	...	200·0	sol. in alc. and ether
,, Oxalate	nearly insol.	30·0	...	insoluble
Zinc, Bromide	deliqu	escent	vy. sol.	very soluble
,, Chloride	0·333	...	300·0	very soluble
,, Iodide	vy. de	liques.	& sol.	very soluble

Percentage of Real Ammonia in Solutions of different Densities at 14° Centigrade.—Carius.

Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.	Specific Gravity.	Percentage Ammonia.
0·8844	36·0	0·9052	27·0	0·9314	18·0	0·9631	9·0
0·8864	35·0	0·9078	26·0	0·9347	17·0	0·9670	8·0
0·8885	34·0	0·9106	25·0	0·9380	16·0	0·9709	7·0
0·8907	33·0	0·9133	24·0	0·9414	15·0	0·9749	6·0
0·8929	32·0	0·9162	23·0	0·9449	14·0	0·9790	5·0
0·8953	31·0	0·9191	22·0	0·9484	13·0	0·9831	4·0
0·8976	30·0	0·9221	21·0	0·9520	12·0	0·9873	3·0
0·9001	29·0	0·9251	20·0	0·9556	11·0	0·9915	2·0
0·9026	28·0	0·9283	19·0	0·9593	10·0	0·9959	1·0

THERMOMETRIC TABLES,
Showing the Assimilation of the Thermometers in Use throughout the World.

Celsius.	Réaumur.	Fahrenheit.	Celsius.	Réaumur.	Fahrenheit.
100	80·0	212·0	49	39·2	120·2
99	79·2	210·0	48	38·4	118·4
98	78·4	208·4	47	37·6	116·6
97	77·6	206·6	46	36·8	114·8
96	76·8	204·8	45	36·0	113·0
95	76·0	203·0	44	35·2	111·2
94	75·2	201·2	43	34·8	109·4
93	74·4	199·4	42	33·6	107·6
92	73·6	197·6	41	32·8	105·8
91	72·8	195·8	40	32·0	104·0
90	72·0	194·0	39	31·2	102·2
89	71·2	192·2	38	30·4	100·4
88	70·4	190·4	37	29·6	98·6
87	69·6	188·6	36	28·8	96·8
86	68·8	186·8	35	28·0	95·0
85	68·0	185·0	34	27·2	93·2
84	67·2	183·2	33	26·4	91·4
83	66·4	181·4	32	25·6	89·6
82	65·6	179·6	31	24·8	87·8
81	64·8	177·8	30	24·0	86·0
80	64·0	176 0	29	23·2	84·2
79	63·2	174·2	28	22·4	82·4
78	62·4	172·4	27	21·6	80·6
77	61·6	170·6	26	20·8	78·8
76	60·8	168·8	25	20·0	77·0
75	60·0	167·0	24	19·2	75·2
74	59·2	165·2	23	18·4	73·4
73	58·4	163·4	22	17·6	71·6
72	57·6	161·6	21	16·8	69·8
71	56·8	159·8	20	16·0	68·0
70	56·0	158·0	19	15·2	66·2
69	55·2	156·2	18	14·4	64·4
68	54·4	154·4	17	13·6	62·6
67	53·6	152·6	16	12·8	60·8
66	52·8	150·8	15	12·0	59·0
65	52·0	149·0	14	11·2	57·2
64	51·2	147·2	13	10·4	55·4
63	50·4	145·4	12	9·6	53·6
62	49·6	143·6	11	8·8	51·8
61	48·8	141·8	10	8·0	50·0
60	48·0	140·0	9	7·2	48·2
59	47·2	138·2	8	6·4	46·4
58	46·4	136·4	7	5·6	44·6
57	45·6	134·6	6	4·8	42·8
56	44·8	132·8	5	4·0	41·0
55	44·0	131·0	4	3·2	39·2
54	43·2	129·2	3	2·4	37·4
53	42·4	127·4	2	1·6	36·5
52	41·6	125·6	1	0·8	33·8
51	40·8	123·8	0	0·0	32·0
50	40·0	122·0			

TABLE SHOWING THE HOURLY VARIATION IN THE SUN'S POSITIO

CALCULATED B

Mean Time	A.M. 4	5	6	7	8	9	10	11
Jan. 1						41° E.	29° E.	16° E.
Feb. 1					59° E.	47	35	19
,, 20					63	50	36	20
Mar. 8				77° E.	65	52	37	21
,, 21				80	67	53	38	22
April 2			94° E.	82	69	55	40	21
,, 19		108° E.	97	85	72	58	41	21
May 8		111	100	89	76	61	44	22
,, 27	125° E.	114	103	91	79	65	47	26
June 22	127° E.	116	106	95	82	68	51	28
July 18		115	104	93	81	67	51	29
Aug. 5		114	101	91	78	62	47	27
,, 25			97	85	73	59	43	[illegible]
Sept. 10			92	80	67	54	38	19
,, 23			88	77	64	50	35	17
Oct. 6				73	60	46	31	15
,, 22				69	57	44	29	12
Nov. 9					53	40	27	11
,, 22					52	39	25	11
Dec. 22						40	27	15

Calculated for latitude 52° N

To Deposit Gold upon Steel.—Make a solution of chloride of gold, th strength being immaterial, provided it be not too weak. We have alwa preferred having as little water as possible. Into this solution pour sulphur ether, and, having replaced the stopper of the bottle, shake the mixture we up, when it will be found that the gold has left the water and entered in combination with the ether. Upon immersing a piece of bright polished steel—such as the blade of a knife—in this, it will instantly become coated wi metallic gold.

IN DEGREES FROM THE SOUTH, AT DIFFERENT SEASONS OF THE YEAR.
J. A. C. BRANFILL.

	P.M.							
Noon	1	2	3	4	5	6	7	8
1° E.	13° W.	27° W.	40° W.					
4	12	27	40	53° W.				
4	13	29	44	57				
4	15	31	46	61	73° W.			
3	17	34	49	64	77	89° W.		
1	20	39	54	69	81	92		
1° W.	22	42	58	73	85	97	108° W.	
2	26	46	63	77	90	102	113	
1° W.	27	49	67	80	93	104	114	126° W.*
1° E.	27	49	67	81	94	105	115	127° W
2	23	46	64	79	91	102	113	125
2	22	44	61	75	88	100	111	
1	21	41	58	72	85	97	108*	
1° W.	21	39	55	69	82	94		
3	21	38	53	67	79			
4	21	37	52	65	77			
	20	36	50	63				
5	19	34	47	59				
4	19	33	45					
1° W.	15	28	41					

N.B.—Bearings marked * are taken when the sun is below the horizon.

TO PREPARE OX-GALL FOR ARTISTIC OR SCIENTIFIC PURPOSES. — Procure from a butcher half a pint of ox-gall. Place this in a clean saucepan and add an ounce of powdered alum and an ounce of common salt. Place over the fire, and when it boils remove for half an hour to cool; then boil again, and repeat this boiling and cooling for three or four times. After this allow it to settle for three or four hours, and decant off into a bottle, in which put two or three drops of essence of lemon. Cork and preserve for use.

UNIVERSAL EXPOSURE TABLE.

By F. B. Taylor.

Exposure = A × B × C × D × E seconds.
Intermediate factors 3/8, 3/4, 3/2, 3, 6 for **f/10, f/14, f/20, &c.**

Factor.	A. Subject and Distance to Shadows.	B. Stop.	C. Light.	D. Altitude of Sun.	E. Plate.
$\frac{1}{16}$	Clouds or distant mountains. **over ¼ mile.**	f/4	Expose for the shadows. *Less* exposure is required at high elevations, *e.g.* 5000 feet above sea level; and variations may be indicated by the colour of buildings or foliage, or lighting of interiors.		
$\frac{1}{8}$	Sea coast with sky or ships. **¼ mile.**	f/5·6			
$\frac{1}{4}$	Open landscape, or distant view. No near foreground. **100 yards.**	f/8	Angle of view when p/f = ·5, 1, 1·5, 2. is 28°, 53°, 74°, 90° Diff. for ·1, 6°, 5°, 4°, 3°.		**25 War.** Extra rapid. Drop shutter.
$\frac{1}{2}$	Landscape with trees. **100 feet.**	f/11	Full sun light.	90° to 80°	**22 23 W.** Rapid: 60 times.
1	View with near buildings or trees. **40 feet.**	f/16	Bright diffused light.	70° to 54°	**20 W.** Instantaneous 30 times.
2	Dark foliage in close foreground: Buildings in shade. **20 feet.**	f/22	Dull light.	36° to 27°	**17-18 W.** Ordinary: 15 times.
4	Portrait out of doors: Copying same size. **10 feet.**	f/32	Very gloomy.	18° to 14°	**15 W.** Slow. 10 times. wet.
8	Under trees. Indoor portrait near large window.	f/45	Slight fog.	9° to 7°	F. B. T. June, 1895.

For **portraits** in ordinary rooms × by 16: For **interiors** read B × C × D × E in **minutes**; reduce if well lighted or extensive.
For **enlargements or reductions** n times × by $(n+1)^2$. Distance of lens from plate = $(n+1)$ f = n times distance of lens from original.

Index of definition **ad** = $3f^2$, which is constant for each lens; **stop f/a.**
Focus on object at **d** yards, all beyond **d/2** yards is in focus.
Focus on distant object, all beyond **d** yards is in focus.

FORM OF NOTE-BOOK

No.	Lens.	A. Subject. ¶ A, 40 ft. B, f/16. C, Bright, diffused. D, Sun 70°—54°. E, 20 W or 30 times. **Exposure 1 × 1 × 1 × 1 × 1 = 1 Sec.**	B. Stop.	C. Light.
	in.		f/	
	in.		f/	

North 53 40 o 23	June 21.	May 22. July 22.	Apr. 21. Aug. 21.	Mar. 22. Sept. 21.	Feb. 20. Oct. 21.	Jan. 20. Nov. 21.	Dec. 21.	North 53 40 o 23
12 Noon	60 73 67 90	57 70 70 87	49 62 78 79	37 50 90 67	25 38 78 55	17 30 70 47	14 27 67 44	12 Noon.
11 A. M. 1 P. M.	58 69 62 76	54 65 65 75	46 58 70 71	35 47 75 62	23 35 70 52	15 27 65 43	13 24 62 41	11 A. M. 1 P. M.
10 A. M. 2 P. M.	52 60 52 63	49 57 54 62	41 50 57 59	31 41 60 52	20 30 57 44	12 23 54 37	9 20 52 34	10 A. M. 2 P. M.
9 A. M. 3 P. M.	45 49 40 49	41 46 41 48	35 41 43 45	24 32 45 40	14 23 43 33	7 16 41 28	4 14 40 25	9 A. M. 3 P. M.
8 A. M. 4 P. M.	37 38 27 36	33 35 27 34	27 30 28 31	17 22 30 27	7 13 28 21	0 8 27 17	. 5 27 15	8 A. M. 4 P. M.
7 A. M. 5 P. M.	27 26 14 22	24 24 14 21	18 19 14 17	9 11 15 13	. 3 14 7	. . 14 4	. . 14 3	7 A. M. 5 P. M.
6 A. M. 6 P. M.	18 15 o 7	15 12 o 6	8 7 o 3	0 o o 0	. . o .	. . o .	. . o .	6 A. M. 6 P. M.
5 A. M. 7 P. M.	10 4 . .	7 2 . .	Speed of plates.					
4 A. M. 8 P. M.	2 . . .							
South 53 40 o 23	Dec. 21.	Nov. 21. Jan. 20.	Oct. 21. Feb. 20.	Sept. 21. Mar. 22.	Aug. 21. Apr. 21.	July 22. May 22.	June 21.	South 53 40 o 23

FOR USE WITH ABOVE.

D. Date, Hour, Sun's Alt.	E. Plate.	Factors. A.	B.	C.	D.	E.	Exposure. Due.	True.	Remarks.
: : ; m.	W.								Developer.
: : ; m.	W.								Developer.
:									Developer.

COLONEL STUART WORTLEY'S EXPOSURE TABLE.

THE following is an extract from an article, in a former ALMANAC, by the late Colonel Stuart Wortley:—

'I took the opportunity during my voyage into distant lands to make some careful tests of the different quality of the light in various places. These tests were made with two different kinds of actinometers, as well as by a special set of dry films made for the purpose, in order that I might compare the actual working of a plate with the scientific test of actinometry.

'I did not find that the light was so greatly superior in foreign countries as is generally supposed; and, putting the light of a very fine English day as 750, I found the power of light in various places to be as follows:—

At sea, 28 S. Pacific Ocean	1000
,, 42 S. Atlantic Ocean	970
Tahiti, in early morning	950
At sea, 16 S. Pacific Ocean	950
,, 21 N. ,,	900
In San Francisco harbour	870
On Rocky Mountains	850
Summit of Sierra Nevada	820
Virginia, Southern States of America	800
Sidney, Australia	800
Melbourne, ,,	800
Niagara Falls	780
England	750

'I will not trouble you with the light, that was worse than a good English day, beyond saying that the light at the Equator was comparatively poor in quality, though apparently very brilliant.'

RELATIVE EXPOSURES FOR VARYING PROPORTIONS OF IMAGE TO THE ORIGINAL.

[The following paper was read before the Royal Photographic Society by Mr. W. E. Debenham. Its usefulness would be diminished by abbreviation, hence we reproduce it in full.—ED.]

WHEN an enlarged photograph has to be made, either from a negative or print, it is commonly understood that the greater the degree of enlargement the longer will be the exposure required, but I have generally found only the vaguest ideas to exist as to the amount by which such exposure has to be prolonged. Sometimes, indeed, it is assumed that the exposure will be in direct inverse proportion to the area covered, so that a copy of twice the linear dimensions of the original—covering, as it does, the area of four times the size—would require an exposure of four times that sufficing for a copy of the same size. This calculation, however, omits to recognise an important factor, and leads to serious error; the actual exposure required in the case mentioned (assuming the same lens and stop to be used) being not four times, but two and a quarter times, that of a copy of same size; whilst, when we come to high degrees of enlargement, the error would amount to an indication of nearly four times the exposure actually required.

To find the relative exposure, add one to the number of times that the length of the original is contained in the length of the image, and square the sum. This will give the figure found in the third column of the annexed table.

Proportion of image to original (linear).	Distance of image from lens * in terms of principal focus.	Proportionate exposures.	Exposures proportioned to that required for copying same size.
$\frac{1}{30}$	$1\frac{1}{30}$	1·07	·27
$\frac{1}{20}$	$1\frac{1}{20}$	1·10	·28
$\frac{1}{10}$	$1\frac{1}{10}$	1·21	·3
$\frac{1}{8}$	$1\frac{1}{8}$	1·27	·31
$\frac{1}{6}$	$1\frac{1}{6}$	1·36	·34
$\frac{1}{4}$	$1\frac{1}{4}$	1·56	·39
$\frac{1}{2}$	$1\frac{1}{2}$	2·25	·56
$\frac{3}{4}$	$1\frac{3}{4}$	3·06	·76
(Same 1	2	4	1
size) 2	3	9	2·25
3	4	16	4
4	5	25	6·25
5	6	36	9
6	7	49	12·25
7	8	64	16
8	9	81	20·25
9	10	100	25
10	11	121	30·25
11	12	144	36
12	13	169	42·25
13	14	196	49
14	15	225	56·25
15	16	256	64
16	17	289	72·25
17	18	324	81
18	19	361	90·25
19	20	400	100
20	21	441	110·25
21	22	484	121
22	23	529	132·25
23	24	576	144
24	25	625	156·25
25	26	676	169
26	27	729	182·25
27	28	784	196
28	29	841	210·25
29	30	900	225
30	31	961	240·25

* With a double lens it is usually sufficient to measure from the position of the diaphragm plate.

As examples: suppose a copy is wanted having twice the linear dimensions of the original. Take the number 2, add 1 to it, and square the sum, $3^2=9$. Again, if a copy is to be of eight times the linear dimensions of the original, take the number 8, add 1, and square the sum, $9^2=81$. Copies respectively twice and eight times the size (linear) of the original will thus require relative exposures of 9 and 81—*i.e.*, the latter will require nine times the exposure of the former.

It is convenient to have a practical standard for unity. An image of the same size as the original is a familiar case, and serves as such standard. By dividing the figures in the third column by four, we get at the figures in the last column, which represent the exposure required for varying degrees of enlargement or reduction, compared with the exposure for a copy of the same size.

The table is carried up to enlargements of thirty diameters; that is about the amount required for enlarging a small *carte-de-visite* to life size.

The exposures required in reductions do not vary at all to the same extent that they do in enlargements. It has, therefore, not been thought necessary to fill in the steps between images of $\frac{1}{10}$ and $\frac{1}{20}$, and between $\frac{1}{20}$ and $\frac{1}{30}$ of the size of the original. Beyond $\frac{1}{30}$ there is scarcely any perceptible difference in the exposure until disturbance comes in from another cause, a considerable distance of illuminated atmosphere (haze or fog) intervening.

The figures in the second column will also serve as a table for distances from the lens to the plate and to the original, all that is necessary being to multiply by the principal focus of the lens in use. In the case of enlargements the figures less than 2 must be multiplied to get the distance from the original to the lens, and the figures greater than 2 for the distance from lens to image. For reductions, the figures less than 2, multiplied by the principal focus of the lens, yield the distance from lens to plate; and the figures higher than 2, similarly multiplied, give the distance of original from lens.

'UNIFORM SYSTEM' NUMBERS FOR STOPS FROM $\frac{f}{1}$ TO $\frac{f}{100}$.

In the following table Mr. S. A. Warburton has calculated the exposure necessary with every stop from $\frac{f}{1}$ to $\frac{f}{100}$ compared with the unit stop of the 'uniform system' of the Royal Photographic Society of Great Britain. The figures which are underlined show in the first column what $\frac{f}{a}$ must be in order to increase the exposure in geometrical ratio from $\frac{f}{4}$, the intermediate numbers showing the uniform system number for any other aperture.

f	U. S. No.	f	U. S. No.	f	U. S. No.
1	$\frac{1}{16}$	15	14·06	58	210·25
1¼	·097	16	16	59	217·56
1·414	$\frac{1}{8}$	17	18·06	60	225·00
1½	·140	18	20·25	61	232·56
1¾	·191	19	22·56		240·25
2	$\frac{1}{4}$	20	25·00	63	248·06
2¼	·316	21	27·56	64	256
2½	·390	22	30·25	65	264·06
2·828	$\frac{1}{2}$	22·62	32	66	272·25
2¾	·472	23	33·06	67	280·56
3	·562	24	36·00	68	289·00
3¼	·660	25	39·06	69	297·56
3½	·765	26	42·25	70	306·25
3¾	·878	27	45·56	71	315·06
4	1·00	28	49·00	72	324·00
4¼	1·12	29	52·56	73	333·06
4½	1·26	30	56·25	74	342·25
4¾	1·41	31	60·06	75	351·56
5	1·56	32	64	76	361·00
5¼	1·72	33	68·06	77	370·56
5½	1·89	34	72·25	78	380·25
5·656	2	35	76·56	79	390·06
5¾	2·06	36	81·00	80	400·00
6	2·25	37	85·56	81	410·06
6¼	2·44	38	90·25	82	420·25
6½	2·64	39	95·06	83	430·56
6¾	2·84	40	100·00	84	440·00
7	3·06	41	105·06	85	451·56
7¼	3·28	42	110·25	86	462·25
7½	3·51	43	115·56	87	473·06
7¾	3·75	44	121·00	88	484·00
8	4	45	126·56	89	495·06
8¼	4·25	45·25	128	90	506·25
8½	4·51	46	132·25	90·50	512
8¾	4·78	47	138·06	91	517·56
9	5·06	48	144·00	92	529·00
9¼	5·34	49	150·06	93	540·56
9½	5·64	50	156·25	94	552·25
9¾	5·94	51	162·56	95	564·06
10	6·25	52	169·00	96	576·00
11	7·56	53	175·56	97	588·06
11·31	8	54	182·25	98	600·25
12	9·00	55	189·06	99	612·56
13	10·56	56	196·00	100	625·00
14	12·25	57	203·06		

THE ROYAL PHOTOGRAPHIC SOCIETY'S STANDARD DIAPHRAGMS.

The annexed diagram and table are intended to facilitate the calculation of the proper number with which to mark the diaphragms according to the Royal Photographic Society of Great Britain's Uniform System, which will be found described on another page. This number is called the 'U. S.' (or uniform system number). The numbered circles in the diagram represent the sizes of stops. The photographer, knowing the equivalent focus of his lens, looks along the line opposite the number which represents the circle nearest inside to his diaphragm, and when he gets to the column headed by that equivalent focus the number there found is the U. S. number to be marked on the diaphragm. For example: a lens of eight inches equivalent focus has a diaphragm in size about No. 5 on the diaphragm; running the eye along the line opposite No. 5, we find in the column under—'focus eight inches' the number 11, which is the U. S. number required.

No. of Circle.	4 focus	5 focus	6 focus	7 focus	8 focus	9 focus	10 focus	12 focus	14 focus
1	25	39	56						
2	11	17	25	34	44	56	68		
3	$6\frac{1}{4}$	10	14	19	25	31	40	56	
4	4	$6\frac{1}{4}$	9	12	16	20	25	36	48
5	$2\frac{3}{4}$	$4\frac{1}{4}$	$6\frac{1}{4}$	$8\frac{1}{2}$	11	14	17	25	34
6	2	$3\frac{1}{5}$	$4\frac{1}{2}$	$6\frac{1}{4}$	8	10	13	18	25
7	$1\frac{1}{2}$	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{3}{4}$	6	8	10	14	19
8	$1\frac{1}{4}$	2	$2\frac{3}{4}$	$3\frac{3}{4}$	5	$6\frac{1}{4}$	8	11	15
9	1	$1\frac{1}{2}$	$2\frac{1}{4}$	3	4	5	$6\frac{1}{4}$	9	$12\frac{1}{4}$
10		1	$1\frac{1}{2}$	$2\frac{1}{8}$	$2\frac{3}{4}$	$3\frac{1}{2}$	$4\frac{1}{3}$	6	$8\frac{1}{2}$
11			$1\frac{1}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{5}$	5	6
12			$\frac{7}{8}$	$1\frac{1}{5}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{2}$	$4\frac{3}{4}$
13				1	$1\frac{1}{4}$	$1\frac{5}{6}$	$1\frac{2}{3}$	$2\frac{3}{4}$	4
14					1	$1\frac{1}{4}$	$1\frac{1}{2}$	$2\frac{1}{4}$	3
15						1	$1\frac{1}{3}$	$1\frac{7}{8}$	$2\frac{1}{2}$
16							1	$1\frac{1}{2}$	2
17								$1\frac{1}{3}$	$7\frac{2}{9}$
18								$1\frac{1}{6}$	$1\frac{1}{2}$
19								1	$1\frac{1}{3}$
20									$1\frac{1}{6}$
21									1

TABLE FOR FINDING THE MINIMUM LENGTH OF STUDIO FOR A GIVEN LENS.

(*From the 'American Amateur Photographer.'*)

DISTANCES IN INCHES FROM OBJECT TO LENS.

Equivalent Focus of Lens. In.	3 in. high.	4 in. high.	5 in. high.	6 in. high.	8 in. high.	10 in. high.	12 in. high.	16 in. high.	20 in. high.	24 in. high.	30 in. high.	36 in. high.	48 in. high.	54 in. high.	60 in. high.	72 in. high.
3	75	57														
4	100	76	$61\frac{3}{5}$	52												
5	125	95	77	65	50											
6	150	114	$92\frac{3}{5}$	78	60	$49\frac{1}{5}$										
8	200	152	$123\frac{1}{5}$	104	80	$65\frac{6}{10}$	56									
10	250	190	154	130	100	82	70	55								
12	300	228	$184\frac{4}{5}$	156	120	$98\frac{3}{5}$	84	66	$55\frac{1}{5}$							
16	400	304	$246\frac{2}{5}$	208	161	$131\frac{1}{5}$	112	88	$72\frac{2}{5}$	64	$54\frac{2}{5}$	48				
20	500	380	308	260	200	164	140	110	$90\frac{3}{4}$	80	68	60	50	$46\frac{2}{3}$		
24	600	456	$369\frac{3}{5}$	312	240	$196\frac{4}{5}$	168	132	$110\frac{2}{5}$	96	$81\frac{3}{5}$	72	60	56	$52\frac{4}{5}$	48
30	750	540	462	390	300	246	210	165	$136\frac{1}{8}$	120	102	90	75	70	65	60
36	900	684	$554\frac{2}{5}$	463	360	$307\frac{1}{5}$	252	198	$165\frac{3}{5}$	144	$122\frac{2}{5}$	108	90	84	$79\frac{1}{8}$	72
48	1200	912	$739\frac{1}{5}$	624	480	$393\frac{1}{5}$	336	264	$220\frac{4}{5}$	192	$163\frac{1}{5}$	144	120	112	$105\frac{3}{5}$	96
60	1500	1080	1024	780	600	492	420	330	$272\frac{1}{4}$	240	204	180	150	140	132	120
72	1800	1368	$1108\frac{4}{5}$	936	720	$614\frac{2}{5}$	504	396	$321\frac{1}{5}$	288	$244\frac{4}{5}$	216	180	168	$158\frac{2}{5}$	144

DISTANCES IN INCHES FROM LENS TO GROUND GLASS.

Equivalent Focus of Lens. In.	3 in. high.	4 in. high.	5 in. high.	6 in. high.	8 in. high.	10 in. high.	12 in. high.	16 in. high.	20 in. high.	24 in. high.	30 in. high.	36 in. high.	48 in. high.	54 in. high.	60 in. high.	72 in. high.
3	$3\frac{1}{8}$	$3\frac{1}{6}$														
4	$4\frac{1}{6}$	$4\frac{3}{8}$	$4\frac{5}{18}$	$4\frac{1}{3}$												
5	$5\frac{5}{24}$	$5\frac{5}{18}$	$5\frac{25}{72}$	$5\frac{5}{12}$	$5\frac{5}{9}$											
6	$6\frac{1}{6}$	$6\frac{1}{3}$	$6\frac{5}{12}$	$6\frac{1}{2}$	$6\frac{2}{3}$	$7\frac{1}{5}$										
8	$8\frac{1}{3}$	$8\frac{4}{9}$	$8\frac{5}{9}$	$8\frac{2}{3}$	$8\frac{8}{9}$	$9\frac{1}{9}$	$9\frac{1}{3}$									
10	$10\frac{5}{12}$	$10\frac{5}{9}$	$10\frac{25}{36}$	$10\frac{5}{6}$	$11\frac{1}{9}$	$11\frac{7}{18}$	$11\frac{1}{2}$	$12\frac{2}{9}$								
12	$12\frac{1}{2}$	$12\frac{2}{3}$	$12\frac{5}{6}$	13	$13\frac{1}{3}$	$13\frac{2}{3}$	14	$14\frac{2}{3}$	$15\frac{1}{3}$							
16	$16\frac{2}{3}$	$16\frac{8}{9}$	$17\frac{1}{9}$	$17\frac{1}{3}$	$17\frac{7}{9}$	$18\frac{2}{9}$	$18\frac{2}{3}$	$19\frac{5}{9}$	$20\frac{1}{6}$	$21\frac{1}{3}$	$22\frac{2}{3}$	24				
20	$20\frac{5}{6}$	$21\frac{1}{9}$	$21\frac{7}{18}$	$21\frac{2}{3}$	$22\frac{2}{9}$	$22\frac{7}{9}$	$23\frac{1}{3}$	$24\frac{4}{9}$	$25\frac{5}{24}$	$26\frac{2}{3}$	$28\frac{1}{3}$	30	$33\frac{1}{3}$	35		
24	25	$25\frac{1}{3}$	$25\frac{2}{3}$	26	$26\frac{2}{3}$	$26\frac{5}{9}$	28	$29\frac{1}{3}$	$30\frac{2}{3}$	32	34	36	40	4[illegible]	44	48
30	$31\frac{1}{4}$	$31\frac{2}{3}$	$32\frac{1}{12}$	$32\frac{1}{2}$	$33\frac{1}{3}$	$34\frac{1}{6}$	35	$36\frac{2}{3}$	$38\frac{1}{3}$	40	$42\frac{1}{2}$	45	50	$52\frac{1}{2}$	55	60
36	$37\frac{1}{2}$	38	$38\frac{1}{2}$	39	$39\frac{2}{3}$	40	42	44	46	48	51	54	60	63	66	72
48	50	$50\frac{2}{3}$	$51\frac{1}{3}$	52	$53\frac{1}{3}$	$54\frac{2}{3}$	56	$58\frac{2}{3}$	$61\frac{1}{3}$	64	68	72	80	84	88	96
60	$62\frac{1}{2}$	$63\frac{1}{3}$	$64\frac{1}{6}$	65	$66\frac{2}{3}$	$68\frac{1}{3}$	70	$73\frac{1}{3}$	$77\frac{2}{3}$	80	85	90	100	105	110	120
72	75	76	77	78	$79\frac{1}{3}$	80	84	88	92	96	102	108	120	126	132	144

Suppose the lens used is 24 in. equivalent focus, and you wish to make a full-length portrait of a man 6 ft. high, in which the image will be 6 in. high. Look at the left-hand column for lens focus, and in the top line for size of image. At the intersection of these columns we find 312 in. = 26 ft., to be the distance the person must stand from the lens. In the next table, using the same lens and size of image as before, at the intersection of the columns we find 26 in., which represents the distance of the ground glass from lens centre. And in the same way any lens and size of image may be computed for.

CONTINENTAL STOPS AND THEIR U.S. EQUIVALENTS.

Mr. Edward M. Nelson says: 'Photographers are frequently troubled by the Continental nomenclature of the stops, and wish to know the U.S. equivalents for them. The method of finding this out is very simple. All that is necessary is to divide f-4 by the ratio to be converted, and square the result. Example: Required the U.S. equivalent of f-9:—

$$\frac{f}{4} \div \frac{f}{9} = \frac{f}{4} \times \frac{9}{f} = 2{\cdot}25;$$

the square of 2·25 is 5·06, the U.S. number required. The following is a table of the Continental stops more commonly met with, and also the Continental values of the U.S. ratios:—

Ratios. f divided by	Continental Values.	U.S. Values.	Ratios. f divided by	U.S. Values.	Continental Values.
4·5	512	1·26	2·828	·5	1250
6·3	256	2·48	4	1	625
7	204	3·06	5·66	2	312
7·2	193	3·24	8	4	156
7·7	168	3·71	11·31	8	78
9	128	5·06	16	16	39
12·5	64	9·77	22·6	32	20
14·5	47	13	32	64	9·77
18	32	20	45·3	128	4·88
25	16	39	64	256	2·44
36	8	81	90·5	512	1·22
50	4	156	...	...	...
71	2	315	...	...	...
100	1	625	...	...	...

'To find the f ratio for the U.S. values, multiply the U.S. value by 16, and the square root of the product is the required ratio. Example: What is the ratio of U.S. 32? 32 multiplied by 16 is 512, the square root of this is 22·6, the ratio required.

'To find the f ratio for the Continental stops, multiply the reciprocal of the square root of the Continental value by 100. Example: What is the f ratio of the Continental value 16? The square root of 16 is 4, the reciprocal of 4 is ·25, which, multiplied by 100, is 25, the ratio required.

'*Note.*—The Continental ratios of 512, 256, and 8, ought to be 4·4, 6·25, and 35, respectively. The figures in the list are those extracted from Continental opticians' catalogues.'

TABLE SHOWING DISPLACEMENT ON GROUND GLASS OF OBJECTS IN MOTION.

By Henry L. Tolman.

From the 'Photographic Times.'

Lens 6 Inches Equivalent Focus, Ground Glass at Principal Focus of Lens.

Miles per hour.	Feet per second.	Distance on Ground Glass, in Inches, with Object 30 Feet away.	Same with Object 60 Feet away.	Same with Object 120 Feet away.
1	1½	·29	·15	·073
2	3	·59	·29	·147
3	4½	·88	·44	·220
4	6	1·17	·59	·293
5	7½	1·47	·73	·367
6	9	1·76	·88	·440
7	10½	2·05	1·03	·513
8	12	2·35	1·17	·587
9	13	2·64	1·32	·660
10	14½	2·93	1·47	·733
11	16	3·23	1·61	·807
12	17½	3·52	1·76	·880
13	19	3·81	1·91	·953
14	20½	4·11	2·05	1·027
15	22	4·40	2·20	1·100
20	29	5·87	2·93	1·467
25	37	7·33	3·67	1·833
30	44	8·80	4·40	2·200
35	51	10·27	5·13	2·567
40	59	11·73	5·97	2·933
45	66	13·20	6·60	3·300
50	73	14·67	7·33	3 667
55	80	16·13	8·06	4·033
60	88	17·60	8·80	4·400
75	110	22·00	11·00	5·500
100	147	29·33	14·67	7·333
125	183	36·67	18·33	9·167
150	220	44·00	22·00	11·000

THE ROYAL PHOTOGRAPHIC SOCIETY'S STANDARDS.

[The following is reprinted from the Society's *Journal.*]

THE Standards adopted by the Society in 1881 have been carefully reconsidered to see what additions or modifications were desirable.

The following statement is complete so far as the subjects it deals with are concerned:—

LENS DIAPHRAGMS.

It is recommended:—

1st. That the aperture of the standard-unit diaphragm have a diameter equal to one-fourth the equivalent focal length of the lens.

2nd. That diaphragms with smaller openings have apertures diminishing in area to the extent of one-half from the unit standard downwards.

3rd. That every diaphragm be marked with its intensity ratio, and also with the relation that the diameter of its aperture bears to the equivalent focal length of the lens, thus:—

$$\frac{f}{4};\ 2\,\frac{f}{5{\cdot}6};\ 4\,\frac{f}{8};\ 8\,\frac{f}{11{\cdot}3};\ 16\,\frac{f}{16};\ 32\,\frac{f}{22{\cdot}6};\ 64\,\frac{f}{32};\ 128\,\frac{f}{45{\cdot}2};\ 256\,\frac{f}{64};\ \&c.$$

Should a lens not admit of a diaphragm with an aperture as large in diameter as one-fourth its focal length, nor exactly any one of the above-mentioned sizes, it is still recommended that all the apertures be made in uniformity with the above scale, with the exception of the largest, which should be marked with the number its area requires in relation to the unit diaphragm. In the case of a lens having a working aperture exceeding in diameter one-fourth its focal length, the diaphragms should be marked according to the sizes of their relative apertures: for example:—

$$0{\cdot}5\,\frac{f}{2{\cdot}8};\ 0{\cdot}25\,\frac{f}{2},\ \&c.$$

And diaphragms which require to be made with apertures intermediate to the standard sizes should be marked in a corresponding manner.

LENS MOUNTS AND FITTINGS.

It is recommended:—

1st. That the equivalent focal length of each lens be engraved upon its mount.

2nd. That the following series of screws for photographic lens flange fittings be adopted:—

Diameter in Inches.	No. of Threads per Inch.	Core Diameter in Inches.
1	24	·9466
1·25	24	1·1966
1·5	24	1·4466
1·75	24	1·6966
2	24	1·9466
2·25	24	2·1966
2·5	24	2·4466
3	24	2·9466
3·5	12	3·3933
4	12	3·8933
5	12	4·8933
And upwards, advancing by inches.	12	

The form of thread is that known as Whitworth's Angular Thread, and is designed as follows:—Two parallel lines, at a distance apart equal to 0·96 of the screw pitch, are intersected by lines inclined to each other at 55°. One-sixth of the vertical height of the triangular spaces so obtained is rounded off both at the top and bottom. The depth of this thread is 0·64 of the screw pitch.

3rd. That every flange and adapter have a mark upon its front to indicate the position of the diaphragm slot or index of any lens when screwed home. The mark on any adapter should coincide with the mark upon any flange into which it is screwed. This mark should be placed at the point at which the thread becomes complete at the shoulder of the flange or adapter.

Camera Screws.

It is recommended:—

That all screws fitted to cameras, either for attachment to the stand, for fixing rising fronts, or for other movable parts, be either $\frac{3}{16}$, $\frac{1}{4}$, $\frac{5}{16}$, or $\frac{3}{8}$ of an inch in external diameter, and in pitch of thread and other details in accordance with the generally recognised Whitworth standards for these sizes.

Focus of Lens, inches.	TIMES OF ENLARGEMENT AND REDUCTION.							
	1 inches.	2 inches.	3 inches.	4 inches.	5 inches.	6 inches.	7 inches.	8 inches.
2	4 4	6 3	8 $2\frac{2}{3}$	10 $2\frac{1}{2}$	12 $2\frac{2}{5}$	14 $2\frac{1}{3}$	16 $2\frac{2}{7}$	18 $2\frac{1}{4}$
$2\frac{1}{2}$	5 5	$7\frac{1}{2}$ $3\frac{3}{4}$	10 $3\frac{1}{3}$	$12\frac{1}{2}$ $3\frac{1}{8}$	15 3	$17\frac{1}{2}$ $2\frac{11}{12}$	20 $2\frac{6}{7}$	$22\frac{1}{2}$ $2\frac{13}{16}$
3	6 6	9 $4\frac{1}{2}$	12 4	15 $3\frac{3}{4}$	18 $3\frac{3}{5}$	21 $3\frac{1}{2}$	24 $3\frac{3}{7}$	27 $3\frac{3}{8}$
$3\frac{1}{2}$	7 7	$10\frac{1}{2}$ $5\frac{1}{4}$	14 $4\frac{2}{3}$	$17\frac{1}{2}$ $4\frac{3}{8}$	21 $4\frac{1}{5}$	$24\frac{1}{2}$ $4\frac{1}{12}$	28 4	$31\frac{1}{2}$ $3\frac{15}{16}$
4	8 8	12 6	16 $5\frac{1}{3}$	20 5	24 $4\frac{4}{5}$	28 $4\frac{2}{3}$	32 $4\frac{4}{7}$	36 $4\frac{1}{2}$
$4\frac{1}{2}$	9 9	$13\frac{1}{2}$ $6\frac{3}{4}$	18 6	$22\frac{1}{2}$ $5\frac{5}{8}$	27 $5\frac{2}{5}$	$31\frac{1}{2}$ $5\frac{1}{4}$	36 $5\frac{1}{7}$	$40\frac{1}{2}$ $5\frac{1}{16}$
5	10 10	15 $7\frac{1}{2}$	20 $6\frac{2}{3}$	25 $6\frac{1}{4}$	30 6	35 $5\frac{5}{6}$	40 $5\frac{5}{7}$	45 $5\frac{5}{8}$
$5\frac{1}{2}$	11 11	$16\frac{1}{2}$ $8\frac{1}{4}$	22 $7\frac{1}{3}$	$27\frac{1}{2}$ $6\frac{7}{8}$	33 $6\frac{3}{5}$	$38\frac{1}{2}$ $6\frac{5}{12}$	44 $6\frac{2}{7}$	$49\frac{1}{2}$ $6\frac{3}{16}$
6	12 12	18 9	24 8	30 $7\frac{1}{2}$	36 $7\frac{1}{5}$	42 7	48 $6\frac{6}{7}$	54 $6\frac{3}{4}$
7	14 14	21 $10\frac{1}{2}$	28 $9\frac{1}{3}$	35 $8\frac{3}{4}$	42 $8\frac{2}{5}$	49 $8\frac{1}{6}$	56 8	63 $7\frac{7}{8}$
8	16 16	24 12	32 $10\frac{2}{3}$	40 10	48 $9\frac{3}{5}$	56 $9\frac{1}{3}$	64 $9\frac{1}{7}$	72 9
9	18 18	27 $13\frac{1}{2}$	36 12	45 $11\frac{1}{4}$	54 $10\frac{4}{5}$	63 $10\frac{1}{2}$	72 $10\frac{2}{7}$	81 $10\frac{1}{8}$

The object of this table is to enable any manipulator who is about to enlarge (or reduce) a copy any given number of times, to do so without troublesome calculation. It is assumed that the photographer knows exactly what the focus of his lens is, and that he is able to measure accurately from its optical centre. The use of the table will be seen from the following illustration:—A photographer has a *carte* to enlarge to four times its size, and the lens he intends employing is one of six inches equivalent focus. He must, therefore, look for 4 on the upper horizontal line, and for 6 in the first vertical column, and carry his eye to where these two join, which will be at 30—$7\frac{1}{2}$. The greater of these is the distance the sensitive plate must be from the centre of the lens; and the lesser, the distance of the picture to be copied. To *reduce* a picture any given number of times the same method must be followed, but in this case the greater number will represent the distance between the lens and the picture to be copied; the latter, that between the lens and the sensitive plate. This explanation will be sufficient for every case of enlargement or reduction.

If the focus of the lens be twelve inches, as this number is not in the column of focal lengths, look out for six in this column and multiply by 2, and so on with any other numbers.

TABLE OF VIEW-ANGLES.

By Clarence E. Woodman, Ph.D.

Divide the Base of the Plate by the Equivalent Focus of the Lens

If the quotient is	The angle is	If the quotient is	The angle is	If the quotient is	The angle is
	Degrees.		Degrees.		Degrees.
·282	16	·748	41	1·3	66
·3	17	·768	42	1·32	67
·317	18	·788	43	1·36	68
·335	19	·808	44	1·375	69
·353	20	·828	45	1·4	70
·37	21	·849	46	1·427	71
·389	22	·87	47	1·45	72
·407	23	·89	48	1·48	73
·425	24	·911	49	1·5	74
·443	25	·933	50	1·53	75
·462	26	·954	51	1·56	76
·48	27	·975	52	1·59	77
·5	28	1·	53	1·62	78
·517	29	1·02	54	1·649	79
·536	30	1·041	55	1·678	80
·555	31	1·063	56	1·7	81
·573	32	1·086	57	1·739	82
·592	33	1·108	58	1·769	83
·611	34	1·132	59	1·8	84
·631	35	1·155	60	1·833	85
·65	36	1·178	61	1·865	86
·67	37	1·2	62	1·898	87
·689	38	1·225	63	1·931	88
·708	39	1·25	64	1·965	89
·728	40	1·274	65	2·	90

Example.—Given a lens of 13 inches equivalent focus; required the angle included by it on plates respectively $3\frac{1}{4} \times 4\frac{1}{4}$, $4\frac{1}{4} \times 6\frac{1}{2}$, $6\frac{1}{2} \times 8\frac{1}{2}$, 8×10, 10×12, and 11×14.

1. Dividing 4·25 by 13, we have as quotient ·327—midway between the decimals ·317 and ·335 of our table; therefore the required angle is 18° 30′. Similarly—

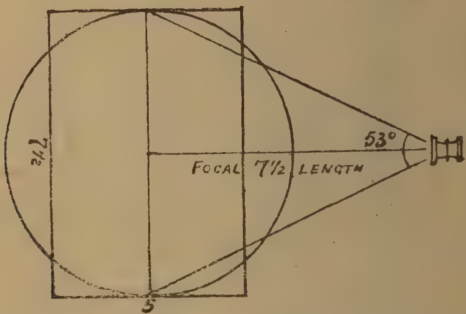
						Degrees.
2. 6·5	÷	13	=	·5;	corresponding to	28.
3. 8·5	÷	13	=	·654;	,, ,,	36.
4. 10	÷	13	=	·77;	,, ,,	$42\frac{1}{2}$.
5. 12	÷	13	=	·923	,, ,,	$49\frac{1}{2}$.
6. 14	÷	13	=	1·08	,, ,,	57.

VIEW-ANGLES.

The late Mr. M. J. Michael wrote us as follows :—

'I take this opportunity of drawing your attention to the "Table of View-angles," in The British Journal Photographic Almanac. If used as there directed, it leads to results inaccurate and misleading; inaccurate, since the angle included on a plate should be measured along the diagonal, and not along the base, of the plate; and the information is misleading, since it leads to the supposition that a lens having the angle which is given by using the table, as there directed, will cover the plate mentioned. Hence all the examples given at the foot of the table specify lenses that, if used on the given plates, must leave at least two, and if the lens is placed centrally, all the four, corners uncovered. If the corners of a plate are to be covered, the angle embraced by the lens must be sufficient to cover the diagonal of the plate; in other words, the circle of illumination given by the lens must have a diameter equal to the diagonal of the plate, and not only equal to the length of the base of the plate.

'A simple figure makes this evident. If the focal length of the lens, *e g.*, seven and a half inches on a $7\frac{1}{2} \times 5$ plate, is equal to the base of the plate, then, using the table as is directed, the quotient obtained is 1 and the angle 53°. From the figure, which is to scale, it is evident that,



arrange the plate as you will, at least two, and if placed centrally, all four, corners must be uncovered, *i.e.*, outside the circle of illumination.

'The table itself is correct when used as is usually directed by dividing the diagonal of any given plate by the focal length of the lens (see Dr. Eder, *Recepte und Tabellen*, fourth edition, page 94). If, therefore, the directions for using it were altered by substituting "diagonal of the plate" for the words, "base of the plate," the results obtained would be correct. It would save trouble if beneath the table were printed the length of the diagonals of the plates most commonly used :—

$3\frac{1}{4} \times 3\frac{1}{4}$	diagonal	4·6	inches.	$6\frac{1}{2} \times 8\frac{1}{2}$	diagonal	10·7	inches.
$3\frac{1}{4} \times 4\frac{1}{4}$	,,	5·3	,,	8×10	,,	12·4	,,
4×5	,,	6·4	,,	10×12	,,	15·6	,,
$4\frac{3}{4} \times 6\frac{1}{2}$	,,	8·	,,	12×15	,,	19·4	,,
$5 \times 7\frac{1}{2}$	,,	9·	,,				

The following simple optical formulæ and calculations, worked out by Mr. J. A. C. Branfill, will prove useful in many branches of photography, especially where several lenses of varying foci are in constant use for a variety of purposes :—

Let p = Principal focus.
F = Greater conjugate do.
f = Lesser do. do.
$D = F + f$ = distance of image from object.
r = Ratio of any dimension in original to the same dimension in copy (in case of reduction), or *vice versâ* (in case of enlargement).
a = Effective diameter of diaphragm.
U. S. No. = 'Uniform System' No. of do.
x = Comparative exposure required.

Then

$$p = D \times \frac{r}{(r+1)^2} = \frac{Ff}{D} = \frac{F}{r+1} = \frac{rf}{r+1}$$

$$F = p\,(r+1) = \frac{pf}{f-p} = rf = \frac{rD}{r+1}$$

$$f = p \times \frac{(r+1)}{r} = \frac{pF}{F-p} = \frac{D}{r+1} = \frac{F}{r}$$

$$D = p \times \frac{(r+1)^2}{r} = f\,(r+1) = p\left(2 + r + \frac{1}{r}\right)$$

$$r = \frac{F-p}{p} = \frac{p}{f-p} = \frac{F}{f}$$

$$\text{U. S. No.} = \frac{p^2}{16\,a^2}$$

$$x = \frac{f^2}{16\,a^2} = \frac{p^2}{16\,a^2} \times \frac{(r+1)^2}{r^2}$$

N.B.—For ordinary landscape work, where r is greater than 20, x may be taken as $\frac{p^2}{16\,a^2}$

NOTE.—In case the above may not be clear to some photographers, the following rules may be better understood :—

To find the principal focus of a lens (p), focus a near object in the camera, and measure the distance between it and the ground-glass (D); next find the proportion which any dimension in the object bears to the same dimension on the ground-glass (r). Thus, if the original dimension be four times as large as its reproduction, we say that r equals (=) 4. Multiply D by r, and divide the product by the square of a number greater by one than r, or $(r + 1)^2$. This rule was lately published by Mr. Debenham.

To find the lesser conjugate focus (f) (if p and r are known) multiply p by the sum of $r + 1$ and divide the product by r. Or divide D by $r + 1$.

To find the greater conjugate focus (F) multiply p by $r + 1$. Or multiply f by r.

To find D (the distance which the ground-glass should be from the object to be copied in order to get a given value for r) multiply p by the sum of $r + \frac{1}{r} + 2$.

To find r divide $F - p$ (the difference between F and p) by p. Or divide p by $f - p$. Or divide F by f.

To find x divide the square of f by 16 times the square of a (the diameter of aperture to lens).

For example: focus an object which is five inches high, so that it is one inch high on the ground glass; thus we know that $r = 5$. Next measure the distance between the object and the ground glass (D), which is found to be 45 inches.

Then $p = 45 \times$ (multiplied by) $5 \div$ (divided by) $6 \times 6 = 6\frac{1}{4}$ inches.
$f = 6\frac{1}{4} \times 6 \div 5 = 7\frac{1}{2}$ inches. Or $f = 45 \div 6 = 7\frac{1}{2}$ inches.
$F = 6\frac{1}{4} \times 6 = 37\frac{1}{2}$ inches. Or $F = 7\frac{1}{2} \times 5 = 37\frac{1}{2}$ inches.
$D = 6\frac{1}{4} \times (5 + \frac{1}{5} + 2) = 6\frac{1}{4} \times 7\frac{1}{5} = 45$ inches.
$r = (37\frac{1}{2} - 6\frac{1}{4}) \div 6\frac{1}{4} = 5$. Or $r = 6\frac{1}{4} \div (7\frac{1}{2} - 6\frac{1}{4}) = 5$.

MR. E. M NELSON'S TABLE OF DISTANCES FOR LANTERN PROJECTION.

DISTANCE OF PROJECTION LENS FROM SCREEN, MASK BEING THREE INCHES.

Foci	4½		5		5½		6		7		8		9		10		11		12	14		15		16		18	
Disc.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	in.	ft.	ft.	in.	ft.	in.	ft.	in.	ft.	in.
5	7	10½	8	9	9	7½	10	6	12	3	14	0	15	9	17	6	19	3	21	24	6	26	3	28	0	31	6
6	9	4½	10	5	11	5½	12	6	14	7	16	8	18	9	20	10	22	11	25	29	2	31	3	33	4	37	6
7	10	10½	12	1	13	3½	14	6	16	11	19	4	21	9	24	2	26	7	29	33	10	36	3	38	8	43	6
8	12	4½	13	9	15	1½	16	6	19	3	22	0	24	9	27	6	30	3	33	38	6	41	3	44	0	49	6
9	13	10½	15	5	16	11½	18	6	21	7	24	8	27	9	30	10	33	11	37	43	2	46	3	49	4	55	6
10	15	4½	17	1	18	9½	20	6	23	11	27	4	30	9	34	2	37	7	41	47	10	51	3	54	8	61	6
11	16	10½	18	9	20	7½	22	6	26	3	30	0	33	9	37	6	41	3	45	52	6	56	3	60	0	67	6
12	18	4½	20	5	22	5½	24	6	28	7	32	8	36	9	40	10	44	11	49	57	2	61	3	65	4	73	6
13	19	10½	22	1	24	3½	26	6	30	11	35	4	39	9	44	2	48	7	53	61	10	66	3	70	8	79	6
14	21	4½	23	9	26	1½	28	6	33	3	38	0	42	9	47	6	52	3	57	66	6	71	3	76	0	85	6
15	22	10½	25	5	27	11½	30	6	35	7	40	8	45	9	50	10	55	11	61	71	2	76	3	81	4	91	6
16	24	4½	27	1	29	9½	32	6	37	11	43	4	48	9	54	2	59	7	65	75	10	81	3	86	8	97	6
18	27	4½	30	5	33	5½	36	6	42	7	48	8	54	9	60	10	66	11	73	85	2	91	3	97	4	109	6
20	30	4½	33	9	37	1½	40	6	47	3	54	0	60	9	67	6	74	3	81	94	6	101	3	108	0	121	6
25	37	10½	42	1	46	3½	50	6	58	11	67	4	75	9	84	2	92	7	101	117	10	126	3	134	8	151	6
30	45	4½	50	5	55	5½	60	6	70	7	80	8	90	9	100	10	110	11	121	141	2	151	3	161	4	181	6
35	52	10½	58	9	64	7½	70	6	82	3	94	0	105	0	117	6	129	3	141	164	6	176	3	188	0	211	6
40	60	4½	67	1	73	9½	80	6	93	11	107	4	120	9	134	2	147	7	161	187	10	201	3	214	8	241	6
45	67	10½	75	5	82	11½	90	6	105	7	120	8	135	9	150	10	165	11	181	211	2	226	3	241	4	271	6
50	75	4½	83	9	92	1½	100	6	117	3	134	0	150	9	167	6	184	3	201	234	6	251	3	268	0	301	6

TABLES OF DISTANCES AT AND BEYOND WHICH ALL OBJECTS ARE IN FOCUS.

SIR D. SALOMON'S TABLE.

Focus of Lens in inches.	Ratios marked on Stops.													
	f/7	*f*/8	*f*/9	*f*/10	*f*/11	*f*/12	*f*/13	*f*/14	*f*/15	*f*/16	*f*/17	*f*/18	*f*/19	*f*/20
	Number of feet after which all is in focus.													
4	19	17	15	14	13	12	11	10	9	9	8	8	7	7
4¼	21	19	17	15	14	12	11	11	10	10	9	9	8	7
4½	25	22	19	17	16	15	13	13	12	11	10	10	9	9
4¾	27	23	21	19	18	16	15	14	13	12	12	11	10	10
5	30	27	24	21	19	18	17	15	14	14	13	12	11	10
5¼	33	29	25	23	21	20	18	17	16	15	14	13	13	12
5½	37	31	29	26	23	22	20	19	17	16	15	15	14	13
5¾	39	34	31	28	26	24	22	20	18	18	17	16	15	14
6	43	38	33	31	28	26	24	22	21	20	18	17	16	15
6¼	47	41	37	33	30	28	26	24	22	20	20	19	18	17
6½	50	45	40	36	33	29	28	26	24	23	21	20	19	18
6¾	55	48	43	39	36	32	30	28	25	24	22	22	21	20
7	58	52	45	42	38	35	31	30	28	26	25	23	22	21

DR. J. J. HIGGINS'S TABLE.

Equivalent Focus.	*f*/5	*f*/6	*f*/7	*f*/8	*f*/9	*f*/10	*f*/11	*f*/12	*f*/13	*f*/14	*f*/15
5 inches	42	35	30	26	23	21	19	17½	16	15	14
5½ ,,	50½	42	36	32	28	25	23	21	19	18	17
6 ,,	60	50	43	38	34	30	27	25	23	21	20
6½ ,,	70½	59	50	44	39	35	32	29½	27	25	23½
7 ,,	82	68	59	51	45	41	39	34	31	29½	27

Calculated for a Confusion Disc of less than $\frac{1}{100}$ of an inch.

TABLE OF DISTANCES FOR AN OBJECT OF SIXTY-EIGHT INCHES HEIGHT.

Computed by P. Brosic.

Equivalent Focus (inches).	Heights of Images (inches).																	
	1	2	3	4	6	8	10	12	14	16	20	24	28	32	40	48	56	68
2	138·0 2·0	70·0 2·1	47.3 2·1	36·0 2·1														
3	207·0 3·0	105·0 3·1	71·0 3·1	54·0 3·2	37·0 3·3													
4	276·0 4·1	140·0 4·1	94·7 4·2	72·0 4·2	49·3 4·4	38·0 4·5												
5	345·0 5·1	175·0 5·1	118·3 5·2	90·0 5·3	61·7 5·4	47·5 5·6	39·0 5·7											
6	414·0 6·1	210·0 6·2	142·0 6·3	108·0 6·4	74·0 6·5	57·0 6·7	46·8 6·9	40·0 7·1	35·1 7·2									
7	483·0 7·1	245·0 7·2	165·7 7·3	126·0 7·4	86·3 7·6	66·5 7·8	54·6 8·0	46·7 8·2	41·0 8·4	36·7 8·6								
8	552·0 8·1	280·0 8·2	189·3 8·4	144·0 8·5	98·7 8·7	76·0 8·9	62·4 9·2	53·3 9·4	46·9 9·6	42 0 9·9	35 2 10·4							
9	621·0 9·1	315·0 9·3	213·0 9·4	162·0 9·5	111·0 9·8	85·5 10·1	70·2 10·3	60·0 10·6	52·7 10·9	47·2 11·1	39 6 11·6							
10	690·0 10·1	350·0 10·3	236·7 10·4	180·0 10·6	123·3 10·9	95·0 11·2	78·0 11·5	66·7 11·8	58·6 12·1	52·5 12·4	44·0 12·9	38·3 13·5	34·3 14·1					
11	759·0 11·2	385·0 11·3	260·3 11·5	198·0 11·6	135·7 12·0	104·5 12·3	85·8 12·6	73·3 12·9	64·4 13·3	57·7 13·6	48·4 14·2	42·2 14·9	37·7 15·5	34·4 16·2				
12	828·0 12·2	420·0 12·4	284·0 12·5	216·0 12·7	148·0 13·1	114·0 13·4	93·6 13·8	80·0 14 1	70·3 14·5	63·0 14·8	52·8 15·5	46·0 16·2	41·1 16·9	37·5 17 6				
13	897·0 13·2	455·0 13·4	307·7 13·6	234·0 13·8	160·3 14·1	123·5 14·5	101·4 14·9	86·7 15·3	76·1 15·7	68·2 16·1	57·2 16·8	49·8 17·6	44 6 18·4	40·6 19·1	35·1 20·6			

Values are omitted in this space on account of the wide angle of lens required. (More than ninety degrees.)

14	966·0 14·2	490·0 14·4	331·3 14·6	252·0 14·8	172·7 15·2	133·0 15·6	109·2 16·1	93·3 16·5	82·0 16·9	73·5 17·3	61·6 18·0	53·7 18·9	48·0 19·8	43·7 20·6	37·8 22·2			
16	1104 16·2	560·0 16·5	378·7 16·7	288·0 16·9	197·3 17·4	152·0 17·9	124·8 18·4	106·7 18·8	93·7 19·3	84·0 19·8	70·4 20·7	61·3 21·6	54·9 22·6	50·0 23·5	43·2 25·4	38·7 27·3	35·4 29·2	
18	1242 18·3	630·0 18·5	426·0 18·8	324·0 19·1	222·0 19·6	171·0 20·1	140·4 20·6	120·0 21·2	105·4 21·7	94·5 22·2	79·2 23·3	69·0 24·4	61·7 25·4	56·2 26·5	48·6 28·6	43·5 30·7	39·9 32·8	36·0 36·0
20	1380 20·3	700·0 20·6	473·3 20·9	360·0 21·2	246·7 21·8	190·0 22·4	156·0 22·9	133·3 23·5	117·1 24·1	105·0 24·7	88·0 25·9	76·7 27·1	68·6 28·2	62·5 29·4	54·0 31·8	48·3 34·1	44·3 36·5	40·0 40·0
22	1518 22·3	770·0 22·6	520·7 23·0	396·0 23·3	271·3 23·9	209·0 24·6	171·6 25·2	146·7 25·9	128·9 26·5	115·5 27·2	96·8 28·5	84·3 29·8	75·4 31·1	68·7 32·4	59·4 34·9	53·2 37·5	48·7 40·1	44·0 44·0
24	1656 24·4	840·0 24·7	568·0 25·1	432·0 25·4	296·0 26·1	228·0 26·8	187·2 27·5	160·0 28·2	140·6 28·9	126·0 29·6	105·6 31·1	92·0 32·5	82·3 33·9	75·0 35·3	64·8 38·1	58·0 40·9	53·1 43·8	48·0 48·0
26	1794 26·4	910·0 26·8	615·3 27·1	468·0 27·5	320·6 28·3	247·0 29·0	202·8 29·8	173·3 30·6	152·3 31·3	136·5 32·1	114·4 33·6	99·7 35·2	89·1 36·7	81·2 38·2	70·2 41·3	62·8 44·4	57·6 47·4	52·0 52·0
28	1932 28·4	980·0 28·8	662·7 29·2	504·0 29·6	345·3 30·5	266·0 31·3	218·4 32·1	186·7 32·9	164·0 33·8	147·0 34·6	123·2 36·2	107·3 37·9	96·0 39·5	87·5 41·2	75·6 44·5	67·7 47·8	62·0 51·1	56·0 56·0
32	2208 32·5	1120 32·9	757·3 33·4	576·0 33·9	394·7 34·8	304·0 35·8	249·6 36·7	213·3 37·6	187·4 38·6	168·0 39·5	140·8 41·4	122·7 43·3	109·7 45·2	100·0 47·1	86·4 50·8	77·3 54·6	70·9 58·4	64·0 64·0
36	2484 36·5	1260 37·1	852·0 37·6	648·0 38·1	444·0 39·2	342·0 40·2	280·8 41·3	240·0 42·4	210·9 43·4	189·0 44·5	158·4 46·6	138·0 48·7	123·4 50·8	112·5 52·9	97·2 57·2	87·0 61·4	79·7 65·6	72·0 72·0
44	3036 44·6	1540 45·3	1041 45·9	792·0 46·6	542·7 47·9	418·0 49·2	343·2 50·5	293·3 51·8	257·7 53·1	231·0 54·3	193·6 56·9	168·7 59·6	150·9 62·1	137·5 64·7	118·8 69·9	106·3 75·1	97·4 80·2	88·0 88·0
52	3588 52·8	1820 53·5	1231 54·3	936·0 55·1	641·3 56·6	494·0 58·1	405·6 59·6	346·7 61·2	304·6 62·7	273·0 64·2	228·8 67·3	199·3 70·4	178·3 73·4	162·5 76·5	140·4 82·6	125·7 88·7	115·1 94·8	104·0 104·0

This table gives, in inches, the distances from lens to object (greater conjugate focus, upper number) and from lens to ground glass (lesser conjugate focus, lower number) for different heights of images and different lengths of foci of lenses, when the height of object is 68 inches (=average height of man).

Examples.

Q.—What is the height of image of a person who is 133 inches distant from lens, when a lens of 14 inches focus is used?
A.—The height of image in this case is 8 inches.

Q.—What are the distances between object, lens, and ground glass if the image of a person is to be 8 inches high and a 14 inches focus lens is employed?
A.—The distance from object to lens will be 133 inches, from lens to ground glass 15·6 inches.

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